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CIPEC

1995-1996
ANNUAL REPORT

CANADIAN

INDUSTRY

PROGRAM

FOR ENERGY

CONSERVATION



INDUSTRIAL
COMPETITIVENESS
THROUGH
MORE
EFFICIENT
ENERGY USE



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Canadian Industry Program for Energy Conservation
580 Booth Street, Ottawa, Ontario K1A 0E4

Chairman's Letter

March 31, 1997

The Honorable Anne McLellan
Minister of Natural Resources, Ottawa, Ontario K1A 0A6

Dear Minister

I am pleased to enclose CIPEC's 1995-1996 Annual Report.

It provides clear, credible proof that, within manufacturing and mining, the voluntary approach to the Climate Change Challenge is working.

Statistics Canada information confirms that companies accounting for more than three-quarters of total manufacturing and mining energy use required 4.8 per cent less energy to produce a unit of production in 1995 than they did in 1990. These results confirm that manufacturing and mining is meeting its target of reducing energy use per unit of production by 1 per cent a year, and there is a high confidence that it will continue to do so to the year 2000.

Furthermore, Environment Canada confirms that manufacturing carbon dioxide emissions were 3 per cent lower in 1995 than in 1990, even though manufacturing output grew by close to 10 per cent over the same time period. Fuel switching has been a major contributing factor in this decline. The use of heavy fuel oil and coal-based fuels declined over this period, while biomass and electricity use increased.

During the past year we focused much effort on getting manufacturing and mining CEO's engaged in the Climate Change Voluntary Challenge Program (VCR). As a result, by December 27, 1996, 275 companies had agreed to implement energy efficiency measures as Industrial Energy Innovators and / or had registered with the VCR direct, a 55 per cent increase over 1995. Of these, 186 companies submitted energy efficiency action plans to the VCR.

Another indication of industry's strong support for the voluntary approach is reflected by the fact that during the past year, CIPEC entered into Letters of Cooperation (LOC's) with 16 new industry associations more than doubling the number of LOC's in effect in 1995.

This is the last annual report to be prepared by CIPEC under the 5-year agreement entered into, in 1992, between NRCan and the Alliance of Manufacturers & Exporters Canada, on behalf of CIPEC. As at April 1, 1997, responsibility for the administration of CIPEC will be re-assumed by your department.

I should like to take this opportunity to extend sincere appreciation for your strong and ongoing support of CIPEC. Also, I would like to thank Peter Torbet, General Manager, Envirosafe Cleaning Systems, for his leadership as Chairman of the CIPEC Task Force Council over the past 10 years. Finally, I should like to thank the CIPEC Secretariat, particularly its Executive Director, Bent Larsen, for their contribution to the achievements of CIPEC.

Industry looks forward to discussing its annual report with you and to exploring how it can build on its working relationship with NRCan in the years ahead.

Yours sincerely,

Charles H. Hantho

Charles H. Hantho
Chairman, CIPEC Policy Board

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Definitions

Industry / CIPEC Universe

Those manufacturing and mining companies included in the SIC codes listed in Appendix 1.

Energy

Energy Demand includes:

- the energy used by the residential, transportation, commercial, agricultural and industrial sectors (secondary energy use)
- non-energy use (feedstocks, asphalt, lubricants and greases, etc.)
- own use (refined petroleum products (RPP's), electricity, gas pipeline, coal, natural gas liquids, etc.)
- conversion losses in electricity generation, steam generation, etc.

Energy Intensity

Physical Energy Intensity

Energy use of companies in an industrial sector divided by that sector's units of production.

Weighted Physical Energy Intensity

A sector's weighted physical energy intensity is derived by multiplying its physical energy intensity by its percentage of total manufacturing and mining energy use.

Economic Energy Intensity

Energy use of companies in an industrial sector divided by the value of production (GDP) in that sector, expressed in 1986 dollars.

Embodied Energy

Includes the inherent (physical properties) energy in a product, plus the energy used in its final production. As used in this report, embodied energy refers only to the energy used in a product's final production.

Industrial Energy

Industrial energy is energy used in stationary sources to produce manufactured and mined products, including:

- purchased and non-purchased fuels - net electricity, natural gas, coal, liquid natural gas, steam, coke, coke oven gas, all petroleum products (light fuel oil, and kerosene, heavy fuel oil, diesel fuel oil, petroleum coke and still gas)
- petroleum refining own use of refined petroleum products

Joule

A joule is the international unit of energy - the energy produced by a power of one watt flowing for one second. There are 3.6 million joules in one kilowatt-hour.

Gigajoule: One gigajoule equals 1×10^{12} joules.

Terajoule: One terajoule equals 1×10^{15} joules.

Petajoule: One petajoule equals 1×10^{18} joules.

Primary Energy Use

The total use of energy, including energy used by the final consumer, and non-energy uses, as described in the Energy Demand section above, intermediate uses of energy, i.e., energy used in transforming one energy form to another (e.g., coal to electricity), and energy used by suppliers in providing energy to the market (e.g., pipeline fuel).

Greenhouse Gases

Greenhouse Gas

A greenhouse gas absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main greenhouse gases are carbon dioxide and methane.

Carbon dioxide

A compound of carbon and oxygen formed whenever carbon is burned. The chemical formula is CO₂. Carbon dioxide is a colourless gas that absorbs infrared radiation. It behaves as a one-way filter allowing incoming visible light to pass through in one direction, while preventing outgoing infrared radiation from passing through in the opposite direction. The one-way filtering effect of carbon dioxide causes an excess of the infrared radiation to be trapped in the atmosphere; thus acting as a greenhouse and has the potential to increase the surface temperature of the earth. Energy use accounts for 98 per cent of carbon dioxide emissions.

Carbon dioxide accounts for over 70 per cent of the greenhouse gas effect.

Carbon dioxide Emissions include those associated with:

- industrial, residential, commercial and transportation emissions;
- power and steam generation;
- non-energy use;
- all own-use.

Framework Convention on Climate Change (FCCC)

The FCCC is a United Nations convention to address climate change, signed by more than 150 countries at the United Nations Conference on Environment and Development, in Rio de Janeiro, in June 1992. Canada was the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work towards stabilizing greenhouse gas emissions at 1990 levels by the year 2000.

Industrial Carbon dioxide Emissions include those associated with:

- the combustion of all fuels listed in the Industrial Energy definition above, except for biomass, and electricity which is entirely allocated to utilities.

Absolute Emissions

The amount of emissions calculated on the basis of emission factors applied by Environment Canada to actual energy consumption.

Embodied Carbon dioxide

Includes the carbon dioxide emissions which would be emitted should the inherent (physical properties) energy in a product and the energy used in its final production be released. In this report, carbon dioxide emissions relate only to the energy used in a product's final production.

Economic

Gross Domestic Product (GDP)

The total value of goods and services produced by Canada's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment, and net foreign trade. GDP figures are reported in 1986 dollars.

Industrial Gross Domestic Product (GDP)

The output of manufacturing and mining industries expressed in 1986 dollars.

Heating Values

Lower Heating Values

Lower heating values (LHV) of fossil fuels reflect only the energy used in the process being employed, for example, in producing cement or cracking petroleum.

Higher Heating Values

Higher heating values (HHV) of fossil fuels reflect all of the energy used in the process being employed.

The difference between the heating values is that LHV exclude the energy lost due to some characteristics of the fuel (e.g., vaporization of water generated by combustion, contaminants, etc.) from the total energy released to the environment through combustion, whereas, HHV includes this energy.

For example, carbon-based fuels that have a high percentage of hydrogen (e.g., natural gas) generate more water as a result of combustion than do carbon-based fuels with a low percentage of hydrogen (e.g., coal). This water is lost as a vapour and the energy required to vaporize it is lost to the process since the vapour is sent up the exhaust stack.

Base Year

Base Year

1990 is the base year for the period 1991 to 1995 from which the physical energy intensity or economic energy intensity performance of industrial companies and sectors is measured. It was established when Canada ratified the Framework Convention on Climate Change (the Rio Accord).

Calculation of the Ten Year Period 1990 to 2000

The ten year period - 1990 to 2000 - is calculated from January 1, 1991 to December 31, 2000.

Acronyms

ASM (Statistics Canada)

Annual Survey of Manufacturers

HHV

Higher heating values

CIEEDAC

The Canadian Industrial Energy End-Use Data and Analysis Centre, School of Resource and Environmental Management, Simon Fraser University, Burnaby, British Columbia

IEI

Industrial Energy Innovators

CIET

Canadian Institute for Energy Training

NRCan

Natural Resources Canada

CIPEC

Canadian Industry Program for Energy Conservation

PCDI

Physical Carbon dioxide Intensity

CPFE (Statistics Canada)

Consumption of Purchased Fuels and Electricity

PEI

Physical Energy Intensity

CO₂

Carbon dioxide

QRESRD (Statistics Canada)

Quarterly Report on Energy Supply and Demand

ECDI

Economic Carbon dioxide Intensity

SIC

Standard Industrial Classification

EEI

Economic Energy Intensity

StatsCan

Statistics Canada

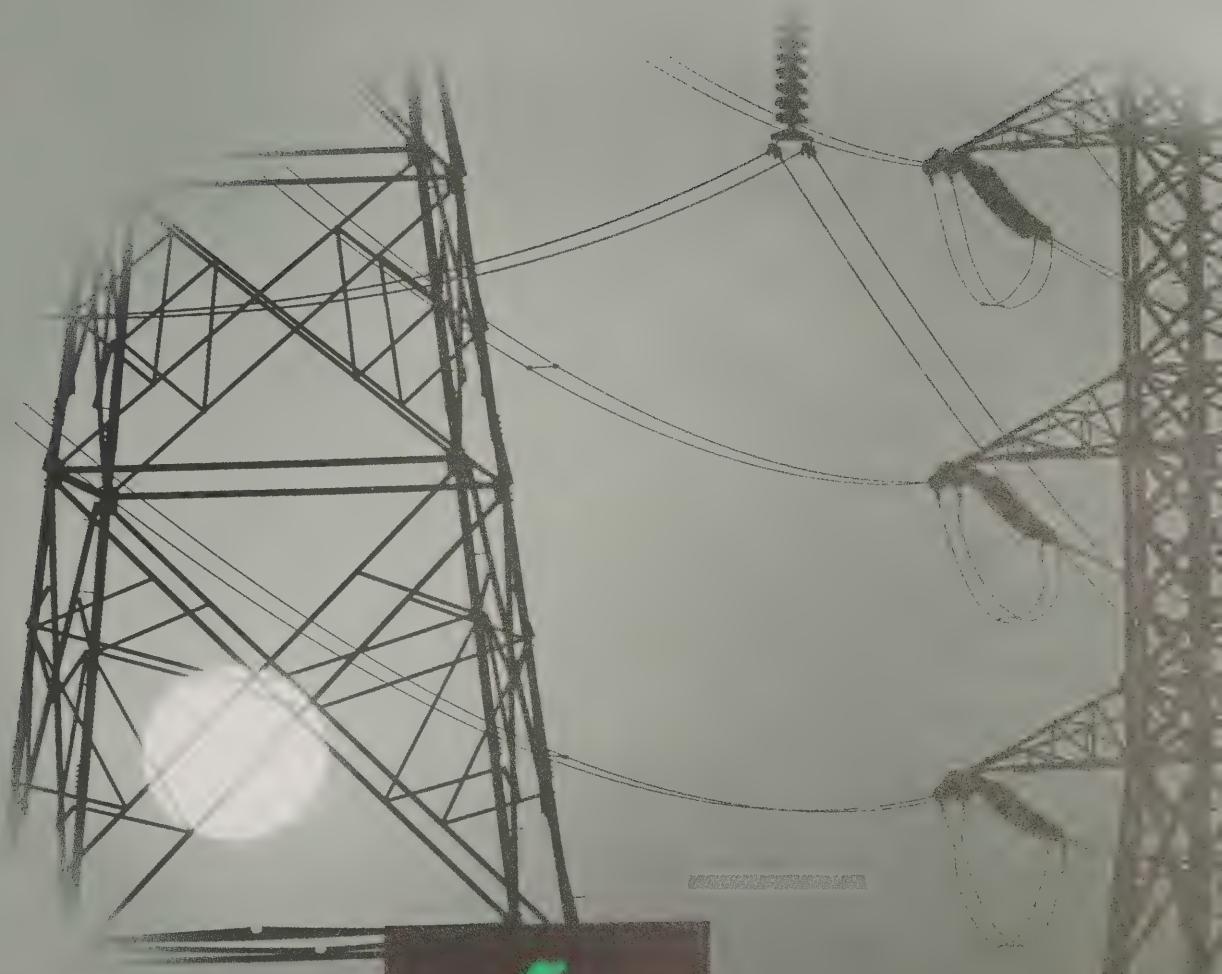
GHG

Greenhouse gases

VCR

Climate Change Voluntary Challenge Registry

Executive Overview



CIPEC

1995-1996
ANNUAL REPORT

Executive Overview

CIPEC's Goal

The major thrust of manufacturing and mining continues to be energy efficiency per unit of production (physical energy intensity - PEI. See definition on page ix).

As CIPEC 2 completes a very successful five year mandate, plans and procedures have been put in place to ensure a smooth and orderly transition to CIPEC 3, effective April 1, 1997. (See Appendix 2)

Industry Highlights

Energy Use, the Economy, Exports and Population Growth: The Context

Economic Growth

- Between 1990 and 1995, industrial GDP grew by 9.5 per cent for an annual average rate of 1.9 per cent.

Population Growth

- Between 1990 and 1995, Canada's population grew by 1.8 million from 27.8 million to 29.6 million, for an annual average rate of 1.2 per cent.

Export Growth

- Between 1990 and 1995, Canada's merchandise exports grew an average of 12.1 per cent per year, from \$145.6 billion to \$253.8 billion.

Energy Use

- Between 1990 and 1995, industrial energy use grew by 9.9 per cent, more slowly than the 11.3 per cent growth in total Canadian energy use.
- Between 1990 and 1995, industry's share of total Canadian energy use fell from 27.5 per cent to 27.2 per cent.

Physical Energy Intensity Performance

Physical Energy Intensity

- 17 industry sectors reduced their physical energy intensity (PEI) on a weighted basis by about 1 per cent per annum between 1990 and 1995. In 1995, the PEI for these 17 sectors was reduced by 0.98 per cent relative to 1994.

In other words, 17 manufacturing and mining sectors representing 77 per cent of total industrial energy use, used 4.8 per cent less energy in 1995 to produce a unit of production than they did in 1990.

These 17 sectors are the only ones for which StatsCan currently has data available from which physical energy intensity can be calculated.

The methodology to determine the PEI of manufacturing and mining is the best available at this time. CIEEDAC and NRCAN are investigating alternative methodologies.

Exports of Embodied Energy

- in 1995, eight sectors - pulp and paper, aluminum, other smelting and refining, steel, metal mining, chemicals, petroleum refining and cement - representing over 71 per cent of total manufacturing and mining energy use, as a group, exported 60 per cent of their production or 1,174 petajoules of embodied energy.

In other words, **43 per cent of the energy consumed by manufacturing and mining in 1995 was contained in the exports of eight industry sectors.**

Carbon dioxide Emissions

Manufacturing Carbon dioxide Emissions

- while industrial energy consumption increased by 9.9 per cent between 1990 and 1995, Environment Canada confirms that carbon dioxide emissions from manufacturing companies were 2,470 kilotonnes, or 3.0 per cent, lower in 1995 than in 1990.

Manufacturing and Mining Carbon dioxide Emissions

- Environment Canada data suggest that, when carbon dioxide emissions of manufacturing are added to those of mining, total emissions were 3,908 kilotonnes, or 4.3 per cent, higher in 1995 than in 1990. Environment Canada is reviewing its data because its total carbon dioxide emissions for mining do not match the aggregate of those sectors which it defines as mining.

Sector Carbon dioxide Performance

- three sectors - oil sands, refined petroleum products and steel - now measure their carbon dioxide emission performance. The performance of other sectors can only be measured when Environment Canada's data is collected on a compatible SIC basis.
- the 1990 to 1995 physical carbon dioxide intensities (PCDI) of these three sectors and their 1995 avoided carbon dioxide emissions were:

	<u>PCDI</u>	<u>1995 Avoided CO₂ Emissions</u>
oil sands	16.6%	2,536 kilotonnes
refined petroleum products	9.5%	1,557 kilotonnes
steel	24.6%	3,278 kilotonnes

Exports of Embodied Carbon dioxide Emissions

- in 1995 - pulp and paper / sawmills; mining, smelting and refining; steel; petroleum refining; and cement - representing over 56 per cent of total manufacturing and mining carbon dioxide emissions, together exported 22,200 kilotonnes of embodied carbon dioxide.
- In other words, **23 per cent of the carbon dioxide emitted by manufacturing and mining in 1995 was contained in the exports of five industry sectors.** This is an important Canadian perspective in the current international negotiations aimed at developing post- 2000 greenhouse gas reduction targets and timetables.

Less embodied carbon dioxide is exported than embodied energy mainly because almost 45 per cent of all the energy used by manufacturing and mining is in the form of electricity and biomass. Most electricity and all biomass energy do not emit carbon dioxide for purposes of calculating emissions.

Task Forces / Trade Associations

Sector Task Forces

- 19 sector task forces have been established, representing 92 per cent of total manufacturing and mining energy use in 1995. Thirteen task forces were in operation in 1996. The remaining 6 task forces will become operational within CIPEC 3.

Letters of Cooperation

- 37 Letters of Cooperation (LOC's) have been signed by CIPEC with 31 manufacturing and mining trade associations and with six food and beverage companies.

Industry Actions

Industrial Energy Innovators / VCR Registrants

- as at December 27, 1996, 275 companies, representing more than 65 per cent of total manufacturing and mining energy use registered with the Climate Change Voluntary Challenge Registry (VCR), a 55 per cent increase from 1995.
- of these 275 companies, 236 companies, or 86 per cent, registered through CIPEC as Industrial Energy Innovators. 39 companies registered direct with the VCR.

Company Action Plans

- 186 companies, or 68 per cent of all manufacturing and mining VCR registrants, representing over 50 per cent of total manufacturing and mining energy use, submitted energy efficiency action plans to the VCR in 1996.

Measuring Performance

Data

- StatsCan's Industrial Consumption of Energy (ICE) Survey was revised and its size more than doubled to over 2,300 companies in 1996, thereby increasing its scope and improving the quality of its sample size.
- while the collection and analysis of energy and carbon dioxide emissions data for manufacturing and mining continues to improve, many areas urgently need additional work and are detailed in Appendices 3 and 4.

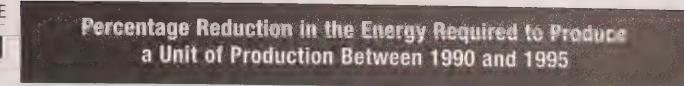
Sector Performance Highlights

Category 1 Sectors — Physical Energy Intensity

The physical energy intensities (PEI) of 17 manufacturing and mining sectors, representing 77 per cent of industrial energy use, have been calculated. Fourteen of those sectors used less energy to produce a unit of production in 1995 than in 1990. See Figure 1.

Three Category 1 sectors used more energy in 1995 to produce a unit of production than in 1990. See Figure 2.

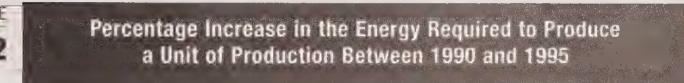
FIGURE 1



Sector	Percentage Reduction	Units of Production
1 Inorganic Chemicals	1.2%	tonne
2 Metal Mining	4.4%	tonne
3 Aluminum	4.5%	tonne
4 Cement (1)	5.6%	tonne
5 Potash	10.5%	tonne
6 Petroleum Refining (2)	10.8%	cubic metres
7 Lime	11.3%	tonne
8 Oil Sands / Upgrader (2)	11.8%	cubic metres
9 Gypsum	13.4%	tonne
10 Steel (3)	14.6%	tonne
11 Brewery Products	15.4%	hectolitres
12 Pulp and Paper (4)	17.9%	tonne
13 Peat	28.8%	tonne
14 Meat & Poultry	38.2%	tonne

1. Cement industry data using Lower Heating Values (LHV).
2. Petroleum Products Task Force and Solomon Associates data.
3. Adjusted 1990 data.
4. Does not include biomass energy.

FIGURE 2



Sector	Percentage Increase	Units of Production
15 Motor Vehicles (1)	6.8%	Vehicles
16 Plastic & Synthetic Resins (2)	25.1%	tonne
17 Agricultural Chemicals (3)	29.5%	tonne

1. See sector report, page 62, for an explanation of some possible reasons for the motor vehicle sector's worsening physical energy intensity.
2. See sector report, page 72, for an explanation of some possible reasons for the plastic and synthetic resins sector's worsening physical energy intensity.
3. See sector report, page 66, for an explanation of some possible reasons for the agricultural chemical sector's worsening physical energy intensity.

Category 2 Sectors — Economic Energy Intensity

The economic energy intensities (EEI) of eight manufacturing and mining sectors representing 3 per cent of industrial energy use, have been calculated. Six of these sectors used significantly less energy in relation to the value of their production in 1995 than in 1990. See Figure 3.

Only two Category 2 sectors used more energy in relation to the value of their production. For bakery products, the latest available data is for 1995 and for iron foundries the latest available data is for 1994. See Figure 4.

FIGURE

3

**Percentage Increase in the Energy Required to Produce
a Dollar (1986) of Production Between 1990 and 1995**

Sector	Percentage Reduction	GDP
1 Plastics Products	5.9%	(1986 \$)
2 Glass and glass products	8.8%	(1986 \$)
3 Motor vehicle parts	13.3%	(1986 \$)
4 Rubber Products	20.4%	(1986 \$)
5 Fruit & Vegetables	20.7%	(1986 \$)
6 Electrical and electronic	42.0%	(1986 \$)

FIGURE

4

**Percentage Increase in the Energy Required to Produce
a Dollar (1986) of Production Between 1990 and 1995**

Sector	Percentage Increase	GDP
7 Bakery Products	9.6%	(1986 \$)
8 Iron Foundries	17.0%	(1986 \$)

Category 3 Sectors — Energy Use Data

Energy use data only is currently collected for some 47 sectors representing 20 per cent of total manufacturing and mining energy use. See page 108.

Year in Review

1995

December

- Statistics Canada's Industrial Consumption of Energy (ICE) Survey was revised and its distribution more than doubled to 2300 companies, increasing its scope and thereby the quality of its sample size.

1996

July

- The Second Conference of the Parties (COP-2) to the United Nations Framework Convention on Climate Change (FCCC) met in Geneva from July 8 to 19, 1996.

Among other things, it was agreed that efforts aimed at developing proposed post-2000 greenhouse gas emission reduction targets and implementation timetables should continue. When finalized, the proposed recommendations will be submitted for ratification at COP-3 in Kyoto, Japan, in December, 1997.

- A committee of CIPEC Task Force Chairs and officials from Natural Resources Canada (NRCan) began redefining CIPEC's role and delivery mechanisms and its relationship to the VCR. Recommendations focused on the future effort of CIPEC around the industry Sector Task Forces and further engaging the vertical associations in the Climate Change issue.

As proposed, the new program to be known as CIPEC 3 would be supported in a more integrated way with resources from the Voluntary Climate Change Registry Office and from NRCan's Industrial Energy Efficiency Initiative. The CIPEC 2 secretariat would be phased out effective April 1, 1997.

- Honourable Anne McLellan, Minister of Natural Resources Canada, established a VCR Task Force, chaired by Chuck Hantho, Chairman CIPEC Policy Board, and made up of senior private sector executives and the Deputy Minister of NRCan with a mandate to chart a future course for the VCR.

November

- The CIPEC Policy Board endorsed the final recommendations of the Committee of Task Force Chairs concerning the establishment of CIPEC 3.
- The Minister of Natural Resource Canada met her Advisory Council on Industrial Energy Efficiency (MACIEE). At that meeting, the Minister indicated she would instruct her officials to cooperate fully in the establishment of CIPEC 3.
- MACIEE confirmed to the Minister that manufacturing and mining continues to meet its target of improving energy efficiency per unit of output by 1 per cent per year.
- CIPEC's Third Annual International Conference was held in Toronto. More than 175 senior manufacturing and mining executives participated.

December

- Federal, provincial and territorial Energy and Environment Ministers met to review Canada's National Action Program on Climate Change.

While the Ministers were pleased with the progress of the VCR in engaging various sectors in climate change actions, they also stated the need to strengthen the VCR by targeting broader participation, encouraging a higher level of action through more comprehensive action plans and challenging goals, and by more effective and standardized reporting.

Structure of Annual Report

This annual report is structured to distinguish those manufacturing and mining sectors which:

- can calculate either physical or economic energy intensities from those which cannot; and,
- have a Sector Task Force from those which do not.

The report provides a road map for identifying:

- where additional sector data is required, either physical or economic units of production;
- those sector reports which have been reviewed by a Sector Task Force and those which have not because a Sector Task Force is not in place;

- those sectors which use relatively little energy and for which it is questionable whether:
 - physical or economic units of production can realistically be measured; and,
 - a Sector Task Force should be established.

The report also highlights some of the anomalies which CIPEC 3 should address.

As well, it requires the reader to review the progress of some Sector Task Forces in more than one section of the report. This is because those Task Forces are made up of sub sectors some of which have data available to calculate physical or economic energy intensities. The data for others only measure energy use. Therefore, the data available determine in which section, of the report a sector appears.

For example, the Transportation Task Force is responsible for eight subsectors, only one of which has data which allows a physical energy intensity to be calculated. Similarly, another subsector has data which allows only its economic energy intensity to be calculated. The other six subsectors have only energy use data collected at this time by StatsCan.

In some cases, the sector energy form data when aggregated do not equal the total energy use reported by StatsCan for the sector.

CIPEC: In Transition

Since the early 1970's, and through its industrial Sector Task Force network, CIPEC has worked with manufacturing and mining companies to reduce the amount of energy they use per unit of production. During this period, CIPEC's structure has also evolved.

CIPEC is now coming to the end of its second phase - CIPEC 2 - and will enter its third phase - CIPEC 3 - effective April 1, 1997.

It will continue to be a focal point to help Canadian industry become more energy efficient.

CIPEC is supported by government, energy utilities and industry associations, and promotes and monitors physical and economic energy intensity throughout Canadian industry.

CIPEC 1 - 1975 to 1990

Created in 1975, when energy security and high energy prices were major concerns, CIPEC is a voluntary initiative of Canada's manufacturing and mining companies.

From 1975 through 1990, CIPEC obtained secretariat support from the then Department of Energy, Mines and Resources Canada. During this period, Canadian industrial companies voluntarily reduced energy consumption per unit of production by over 26.2 per cent, an average annual reduction of 1.6 per cent. This is equivalent to 30 million tonnes of carbon dioxide emissions avoided per year.

Since 1990, the average annual reduction in energy use per unit of production has been 1 per cent. Therefore, from 1975 to 1995, Canadian industrial companies voluntarily reduced energy consumption per unit of production by over 31 per cent.

CIPEC 2 - 1992 to 1997

In 1992, CIPEC refocused its mission in response to Canada signing the Rio Accord and the Accord's commitment to work towards stabilizing greenhouse gas emissions at 1990 levels by the year 2000.

Its activities are governed by an 18 member Policy Board.

Through supporting industry associations, 3,000 companies are now involved in CIPEC, up from 700 during the 1975 to 1990 period.

In 1995, industry contributed well over \$1.5 million in time and effort involved in establishing industry sector physical and economic energy intensity targets, in reporting on their energy intensity performance and in encouraging other companies to give priority to energy efficiency and to the reduction of carbon dioxide emissions. This is in addition to the millions of dollars industry has invested in energy efficiency improvements.

Today, physical and economic energy intensity, global competitiveness and the need to contribute to stabilizing energy related carbon dioxide emissions are key motivating forces for industry's voluntary efforts to reduce its energy consumption per unit of production.

Industry's voluntary physical and economic energy intensity initiatives are coordinated by a 21 member Task Force Council. CIPEC's Policy Board and Task Force Council are supported by a small Secretariat.

CIPEC 2's Mission

To promote effective voluntary action which reduces industrial energy use per unit of production, thereby enhancing economic performance, while participating in meeting Canada's carbon dioxide stabilization objectives.

Policy Board Membership

Chuck Hantho, Chairman
Dominion Textile Inc. and Dofasco Inc.

Bent Larsen
CIPEC Executive Director

Members:

Claude Chamberland
Alcan Aluminium Limited

Arthur Sawchuk
Dupont Canada Inc.

Emmie Leung
International Paper Industries Ltd.

Robert Schad
Husky Injection Molding Systems Ltd.

Ron Morrison
Kodak Canada Inc.

Brenda Schiedel
Coyle & Greer Awards Canada

Ron Munkley
Consumers' Gas Company

Fred Telmer
Stelco Inc.

Michael O'Brien
Sunoco Group, Suncor Inc.

Peter Torbet, Chairman
CIPEC Task Force Council (Ex. Officio)

Frank Pickard*
Falconbridge Ltd.

Stephen Van Houten
Alliance of Manufacturers & Exporters Canada

John D. Redfern,
Lafarge Canada Ltd.

George Weyerhaeuser, Jr.
Weyerhaeuser Canada Ltd.

Bob Renaud
Chrysler Canada

Charles Wilson
Shell Canada Ltd.

Peter Rankine
Honeywell Limited

*Due to the untimely death of Mr. Pickard in 1996, Alex Balough, Falconbridge Ltd. replaced him on an interim basis.

CIPEC Sector Task Force Council

Since 1975, most large manufacturing and mining energy using sectors have been represented on the CIPEC Council.

The Council is composed of the Chairpersons of each Sector Task Force and meets 6 to 8 times a year. In 1996, there were 13 Sector Task Forces in place. A further six Sector Task Forces will be operational in 1997.

Between Council meetings, Sector Task Forces meet to set sector physical and economic energy intensity targets, review progress and to identify the energy efficiency opportunities particular to their sectors.

The interests of approximately 3,000 companies are represented on the CIPEC Sector Task Force Council. In addition, there is a sharing of views with the natural gas and electric utilities and government through representatives from these sectors participating in the Council's activities as associate members.

Task Force Council Membership

Chairman:

Peter Torbet, Envirosafe Cleaning Systems

Executive Director:

Bent Larsen

Task Forces Operational in 1996

Aluminum

Christien Van Houtte, Aluminum Industry Association

Petroleum Refining and Oil Sands / Upgrader

Bob Clapp, Canadian Petroleum Products Institute

Brewery

Ralph Backman, Labatt Breweries of Canada

Pulp and Paper

Norman Pridham, Quono Corporation

Cement

John M. Lind, St. Mary's Cement Company

Steel

Susan Olynyk, Dofasco Inc.

Electrical and Electronic

Steve Horvath, Honeywell Ltd.

Textiles (Primary and Products)

Peter Chantraine, Dupont Canada Inc.

General Manufacturing

Peter Notzl
Alliance of Manufacturers & Exporters Canada

Transportation

Ken Rossi, Ford Motor Company of Canada

Lime

Dick Bowan, Global Stone (Ingersoll) Ltd.

Wood Products

Dick Bryan, Council of Forest Industries

Mining and Non Ferrous Smelting & Refining

Milton Goble, Inco Limited

Task Forces Operational in 1997

Chemical Fertilizers (Potash)

Jim Farrell, Canadian Fertilizer Institute

Foundries

Tony Thoma, Wescast Industries Inc.

Dairy

Catherine Tokarz, National Dairy Council

Plastics

Sandra Birkenmayer
Canadian Plastics Industry Association

Food Processing

Bakery Products
Fruit & Vegetables
Meat & Poultry

Rubber Products

Gord Howarth,
Gates Canada Inc.

Collaborators

Chemical Products

Bruce Caswell
Canadian Chemical Producers Association

Government

Linda Ploeger
Ontario Ministry of Environment and Energy

Utilities

Gillian McLeod, Ontario Hydro
Canadian Electricity Association

Utilities

Philip Jago
Natural Resources Canada

Michael Stedman, Centra Gas
Canadian Gas Association

CIPEC 3 - 1997

Effective April 1, 1997, CIPEC will enter its third phase.

The principal changes will be that NRCan will again assume responsibility for providing administrative support for the CIPEC Task Forces. NRCan will also work with individual trade associations.

Improving data collection and analysis, demonstrating the effectiveness of the voluntary approach and responding to sector needs will be major preoccupations of CIPEC 3. Appendices 3 and 4 set out a number of areas for improvement.

Appendix 2 outlines the transition plan for the future delivery of the Canadian Industry Program for Energy Conservation - CIPEC 3.

**Manufacturing and Mining
Energy Use
in an Economic,
Export and
Population Growth
Context
1990 to 1995**



1995-1996
ANNUAL REPORT

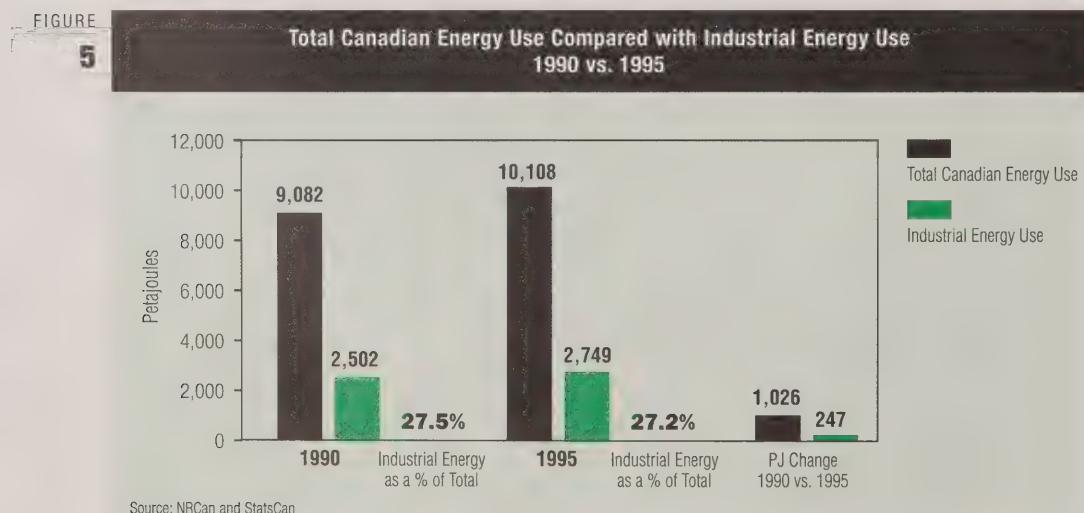
Energy Use, Economic, Export and Population Growth: 1990 to 1995

Energy Use

The CIPEC universe of industry sectors includes most, but not all, of StatsCan's definition of industry. Construction and forestry are the principal SIC sectors not included in the CIPEC universe. See Appendix 1 for a list of the SIC codes for the sectors covered.

Between 1990 and 1995, manufacturing and mining energy consumption increased by 247 petajoules or 9.9 per cent. This compares with an increase in total Canadian energy consumption during the same period of 1,026 petajoules or 11.3 per cent. See Figure 5.

During this same period, manufacturing and mining GDP grew by 9.5 per cent (see Figure 6) and Canada's population grew by 6 per cent. See Figure 8.



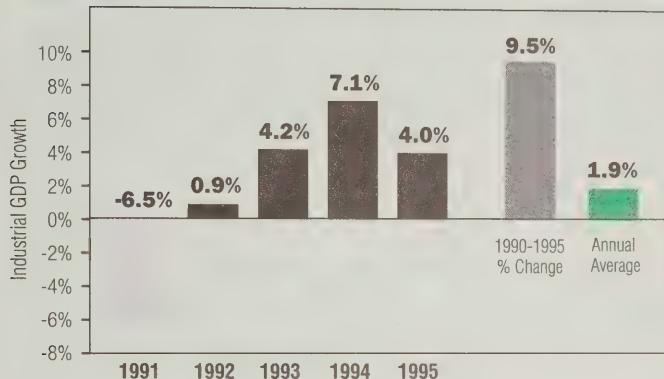
Economic Growth

Industrial output was erratic from 1990 to 1995, from a minus 6.5 per cent in 1991 to a positive 4.0 per cent growth in 1995. Overall, however, Canadian industry grew, on average, 1.9 per cent a year during this period. See Figure 6.

FIGURE

6

Manufacturing and Mining GDP Growth 1990 - 1995



"Industry" includes manufacturing and mining but not construction and forestry.
Source: StatsCan SO4 & MO4

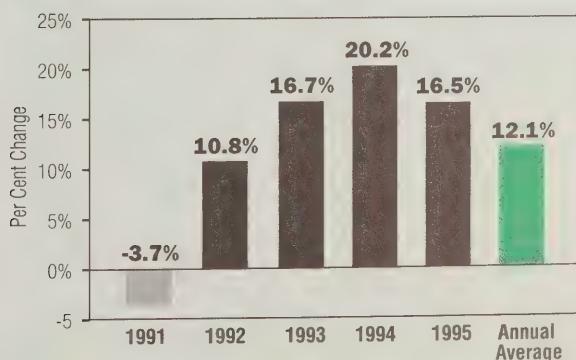
Export Growth

Canada's merchandise exports grew an average of 12 per cent a year from 1990 to 1995, resulting in significant exports of embodied energy and carbon dioxide to other countries.

FIGURE

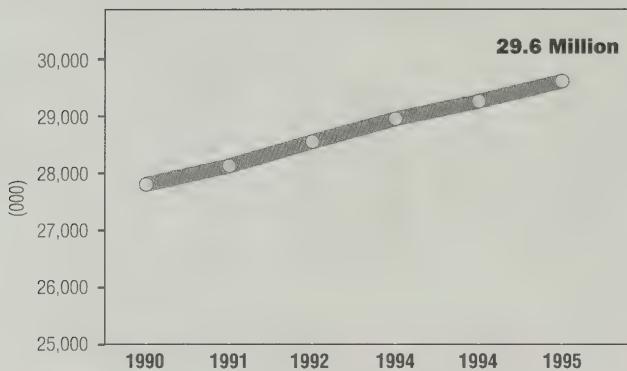
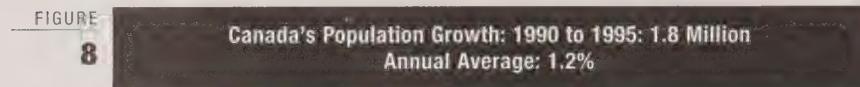
7

Percentage Change in Canada's Merchandise Exports 1990 - 1995



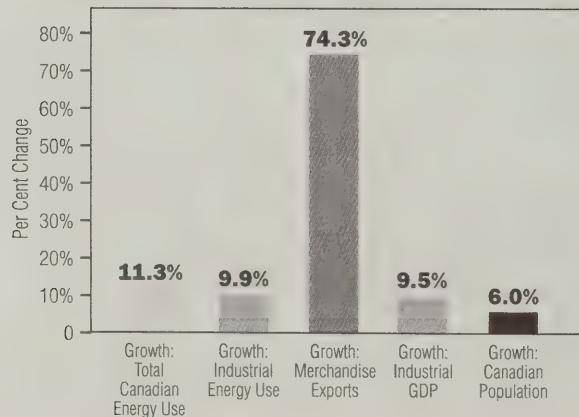
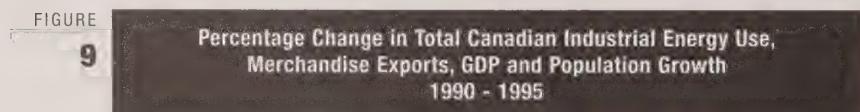
Population Growth

Canada's population grew by 1.8 million people between 1990 and 1995, from 27.8 to 29.6 million, an average annual rate of 1.2 per cent, resulting in greater demand for goods and services and increased industrial energy use.



Summary: Energy Use, GDP, Export and Population Growth

Figure 9 compares the percentage growth in total Canadian and industrial energy use, with industrial GDP exports and population over the period 1990 to 1995. Export growth clearly dominated, resulting in a substantial amount of embodied energy and carbon dioxide being included in exports.



Measuring Industry's Progress: 1990 to 1995

Measuring manufacturing and mining energy intensity performance has been a major CIPEC preoccupation over the past five years.

The basic building block for measuring industry's energy performance is the amount of energy used by each manufacturing and mining sector each year to produce a unit of output. This information is reported upon by StatsCan by SIC number and analyzed by CIEEDAC. Some sectors, such as refined petroleum products, prefer to use other sources of information, however.

Energy Performance Measures

Energy use by sector is used to calculate a variety of energy related performance measures. CIPEC believes, however, energy intensity best measures industrial energy performance. Energy intensity is defined as energy used divided by a unit output.

Units of output, however, can be expressed either in physical units of production or in monetary / economic units (e.g., GDP). Consequently, to calculate either a physical or economic energy intensity, it is necessary to have either physical units of production or the GDP for each sector, in addition to the energy use data for those sectors.

CIPEC prefers to measure manufacturing and mining performance in terms of physical output rather than economic output. This is because the increase or decrease in the dollar value of output has sometimes more to do with changes in product mix, foreign exchange rates, raw material and labour costs , or selling prices, than it has to do with the amount of energy used. Unfortunately, however, StatsCan does not collect physical units for all manufacturing and mining sectors. Indeed, it collects neither physical nor monetary units (GDP) for many manufacturing and mining sectors.

As a result, for measurement purposes this report divides manufacturing and mining sectors into three categories, as follows:

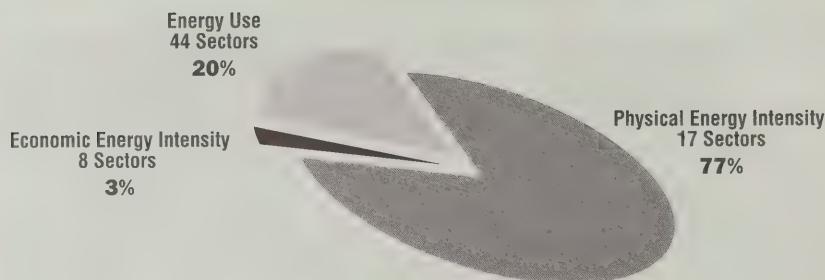
- **Category 1 (Physical Energy Intensity) Sectors:** There are currently 17 sectors, representing 76.9 per cent of total manufacturing and mining energy use, for which energy use and physical units of production data are available and from which physical energy intensities can be calculated.
- **Category 2 (Economic Energy Intensity) Sectors:** There are currently 8 sectors, representing 3.4 per cent of total manufacturing and mining energy use, for which energy use and GDP data are available and from which economic energy intensities can be calculated.
- **Category 3 (Energy Use only) Sectors:** There are 46 sectors, representing 19.7 per cent of total manufacturing and mining energy use, for which only energy use data are available. This means that neither physical nor economic energy intensity can be calculated because there are no physical or economic units against which to measure energy use.

Appendix 4 describes who collects and analyzes manufacturing and mining energy use data, and physical and economic units of output. It also describes who collects and analyzes industry data related to carbon dioxide emissions.

FIGURE

10

1995 Performance Measures as a Percentage of Total Manufacturing and Mining Energy



Carbon dioxide Emission Performance Measures

Manufacturing and mining has committed to the Minister of Natural Resources Canada that it will endeavour to achieve 1990 levels of carbon dioxide emissions by the year 2000, so long as industrial GDP is at or below 2 per cent between 1995 and 2000. (Industrial GDP has averaged 1.9 per cent growth a year between 1990 and 1995.)

In other words, manufacturing and mining measures its carbon dioxide emissions each year relative to the emissions in the 1990 base year.

Based on Environment Canada data and CIEEDAC analysis, it is now possible to report on a sector's carbon dioxide performance in one or more of four ways:

- **absolute carbon dioxide emissions**
 - these are actual carbon dioxide emissions using emission factors applied to energy consumption. Canada's international commitment and progress is measured in tonnes of carbon dioxide emitted.
- **physical carbon dioxide intensity (PCDI)**
 - this measure relates a sector's absolute carbon dioxide emissions to a physical unit of output, for example kilotonnes of iron ore produced.
- **economic carbon dioxide intensity (ECDI)**
 - this is a ratio relating absolute carbon dioxide emissions to the economic value of production in a sector (GDP), measured in 1986 dollars.
- **avoided carbon dioxide emissions**
 - this measure calculates the volume of carbon dioxide emissions that would have been released had the base year's (1990) carbon dioxide intensity been experienced in the subsequent years based on the sector's production or GDP in those years. Avoided carbon dioxide emissions, then, result from improved carbon dioxide intensities.

Three sectors - oil sands, petroleum refining and steel - now measure their carbon dioxide emissions. It is expected that in future years other sectors may follow suit when Environment Canada's data is collected on a compatible SIC code basis.

Manufacturing and Mining Energy Use by Sector: 1990 and 1995

Energy Consumption

Determining the amount of energy used by each manufacturing and mining sector is basic to measuring a sector's efficient use of energy.

In 1996, StatsCan and CIEEDAC collected and analyzed the energy used in 1995 by 39 manufacturing and mining sectors. These sectors consumed 94 per cent of all energy used by manufacturing and mining in that year. For most of the remaining sectors, the latest data available is for 1994. These remaining sectors are identified on pages 108 and 109.

Figure 11 ranks the sectors according to the amount of energy each sector consumed in 1995, the percentage change over the period 1990 to 1995 and, where possible, their annual average physical (PEI) and economic (EEI) energy intensities.

Eight sectors cannot reconcile their data with StatsCan's data, for one reason or another. These sectors have been appropriately footnoted.

**FIGURE
11**

Industrial Energy Use, Physical and Economic Energy Intensity by Sector: 1990 and 1995

#	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total	% age Change	1990 to 1995 An Average PEI	1990 to 1995 An Average EEI
1	Pulp & Paper - 271	748.5	29.9%	848.5	30.9%	13.4%	1.6%	-1.4%
2	Petroleum Refining - 3611 (1)	303.1	12.1%	296.7	10.8%	-2.1%	0.2%	N/A
3	Steel - 2919 (2)	207.8	8.3%	236.4	8.6%	13.8%	1.3%	0.3%
4	Oil Sands / Upgrader - 712 (1)	130.9	5.2%	177.5	6.5%	35.6%	2.8%	N/A
5	Aluminum - 2951	113.9	4.6%	152.0	5.5%	33.5%	0.9%	N/A
6	Organic Chemicals - 3712 (3)	128.2	5.1%	102.6	3.7%	-19.9%	N/A	N/A
7	Metal Mining - 061 (4)	101.5	4.1%	91.2	3.3%	-10.1%	0.9%	N/A
8	Inorganic Chemicals - 3711 (3)	71.4	2.9%	73.2	2.7%	2.5%	0.2%	N/A
9	Non Ferrous Smelting & Refining - 295 (4)	84.7	3.4%	72.1	2.6%	-14.9%	-1.8%	N/A
10	Cement - 3521 (5)	60.0	2.4%	60.6	2.2%	1.0%	0.5%	-4.0%
11	Agricultural Chemicals - 372	42.6	1.7%	57.7	2.1%	35.5%	-5.9%	-3.7%
12	Wood Industry - 25 (6)	39.3	1.6%	56.1	2.0%	42.7%	N/A	N/A
13	Fabricated Metal Product (not mach) - 30	27.5	1.1%	35.5	1.3%	28.8%	N/A	N/A
14	Potash - 0624	27.4	1.1%	31.8	1.2%	16.0%	2.1%	2.0%
15	Plastic & Resins - 3731	17.4	0.7%	28.3	1.0%	62.9%	-5.0%	N/A
16	Primary Textiles - 18 (7)	14.3	0.6%	25.7	0.9%	79.8%	N/A	N/A
17	Motor Vehicles Parts / Asses. - 325	22.2	0.9%	24.9	0.9%	12.4%	N/A	2.4%
18	Motor Vehicles - 3231	18.8	0.7%	24.9	0.9%	32.5%	-1.4%	-0.4%
19	Electrical and Electronic - 33	18.3	0.7%	17.5	0.6%	-4.7%	N/A	8.4%
20	Lime - 3581	14.7	0.6%	15.6	0.6%	6.0%	2.3%	N/A

continued next page

continued

FIGURE

11

Industrial Energy Use, Physical and Economic Energy Intensity by Sector: 1990 and 1995

#	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total	% age Change	1990 to 1995 An. Average PEI	EEI
21	Glass and Glass Products - 356	14.2	0.6%	13.9	0.5%	-1.9%	N/A	0.8%
22	Machinery Industry (ex electrical) - 31	12.6	0.5%	13.7	0.5%	8.2%	N/A	N/A
23	Plastics Products - 16	12.0	0.5%	13.3	0.5%	10.3%	N/A	2.6%
24	Dairy - 104 (8)	12.0	0.5%	12.9	0.5%	8.2%	N/A	N/A
25	Printing, Publishing - 28	8.6	0.3%	11.3	0.4%	31.8%	N/A	N/A
26	Rest of Non-Metal Mining - 62	11.5	0.5%	10.7	0.4%	-7.1%	N/A	N/A
27	Meat & Poultry - 101	15.4	0.6%	10.7	0.4%	-30.8%	7.6%	6.7%
28	Rubber Products - 15	9.1	0.4%	10.4	0.4%	13.9%	N/A	4.8%
29	Textile Products - 19 (7)	6.7	0.3%	9.8	0.4%	45.2%	N/A	N/A
30	Fruit / Vegetables - 103	9.5	0.4%	8.1	0.3%	-14.1%	N/A	-1.0%
31	Other Manufacturing - 39	5.9	0.2%	7.1	0.3%	20.7%	N/A	N/A
32	Bakery Products - 107	5.7	0.2%	6.5	0.2%	14.4%	N/A	-1.2%
33	Brewery Products - 1131	7.1	0.3%	6.2	0.2%	-12.8%	3.1%	3.5%
34	Furniture and Fixtures - 26	5.2	0.2%	6.2	0.2%	19.4%	N/A	N/A
35	Clothing Industry - 24	5.2	0.2%	5.5	0.2%	6.0%	N/A	N/A
36	Leather and Allied Products - 17	1.2	0.0%	1.7	0.1%	38.9%	N/A	N/A
37	Tobacco Products - 12	1.3	0.1%	1.3	0.0%	0.0%	N/A	N/A
38	Peat Industry - 622	0.7	0.0%	0.8	0.0%	20.4%	5.8%	N/A
39	Gypsum Mines - 623	0.6	0.0%	0.5	0.0%	-14.8%	2.7%	N/A
		2,337.0	93.4%	2,579.4	93.8%	13.3%		
	Remaining Sectors	164.9	6.6%	169.8	6.2%	3.0%		
	Total M / M	2,501.9	100%	2,749.3	100%	9.9%		

Source: StatsCan, NRCan, CIEEDAC, CIPEC

- For international comparison purposes, the Petroleum Refining Task Force uses lower heating values for refined petroleum products, while StatsCan uses higher heating values. The refinery industry also uses Solomon Associates of Houston, Texas to evaluate each refinery against an international industry standard. As a result, there are differences in the estimation of energy intensity for refineries between that which can be derived from StatsCan data and from indices developed by Solomon Associates.
- StatsCan 1990 data for the steel sector do not reflect a 5 month strike in that year. The Sector Task Force has adjusted the 1990 energy use number to 219.3 PJ to reflect what the energy use would have been if the strike had not occurred.
- Energy use data shown in this report for the chemical sector are based on Statistics Canada's ICE Survey. The Canadian Chemical Producers' Association (CCPA) annual Reducing Emissions report covers emissions for all greenhouse gases for all of its members. The CCPA methodology does not correspond directly with the energy use data reported by StatsCan and efforts are underway to resolve the differences.
- The Mining Task Force will be working with NRCan, StatsCan and CIEEDAC to reconcile various surveys involving the mining and smelting industries and to develop criteria to more accurately allocate energy use among those sectors.
- The Cement Task Force is concerned with StatsCan's cement production data. In addition, the Cement Task Force uses lower heating values.
- Both CIEEDAC and the Wood Industry Task Force are aware that the energy data for the Wood Products Sector needs to be refined.
- The Textiles Task Force believes that the 1995 data provided to StatsCan by companies in the textile subsectors were not accurate, hence it should not be used to measure the performance of the primary textiles and textiles products sectors.
- The National Dairy Council is reviewing the energy use data for the dairy sector, in particular the data for 1990.

It is possible to calculate both a PEI and an EEI for only eight of the 39 sectors.

For another nine sectors, it is possible to calculate only a PEI, and, for a further seven sectors only an EEI can be calculated. Energy use data only is available for the remaining 15 sectors.

CIPEC Sector Task Forces

CIPEC has established 19 sector Task Forces, 13 of which were operational in 1996. The other 6 will be operational in 1997.

These 19 Task Forces, listed alphabetically, represent 92 per cent of total manufacturing and mining energy use in 1995. For some sectors, the latest data available is for 1993 or 1994.

FIGURE

12

Sectors with CIPEC Task Forces

#	Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
1	Aluminum	Aluminum - 2951	113.9	4.6%	152.0	5.5%
2	Brewery	Brewery Products - 1131	7.1	0.3%	6.2	0.2%
3	Cement (1)	Cement - 3521	60.0	2.4%	60.6	2.2%
4	Chemical Fertilizers *	Agricultural Chemicals - 372	42.6	1.7%	57.7	2.1%
		Potash - 107	27.4	1.1%	31.8	1.2%
		Total Chemical Fertilizers	70.0	2.8%	89.4	3.3%
5	Dairy * (2)	Dairy - 104	12.0	0.5%	12.9	0.5%
6	Electrical / Electronic	Electrical and Electronic - 33	18.3	0.7%	17.5	0.6%
7	Food Processing *	Meat & Poultry - 101	15.4	0.6%	10.7	0.4%
		Fruit & Vegetables - 103	9.5	0.4%	8.1	0.3%
		Bakery Products - 107	5.7	0.2%	6.5	0.2%
		Total Food Processing	30.6	1.2%	25.3	0.9%
8	Foundries *	Iron Foundries - 294	7.2	0.3%	8.1	0.3%
		Aluminum Rolling, Casting & Extruding - 296	5.3	0.2%	6.4	0.2%
		Ferro Alloys - 2911 (1993 latest data)	4.6	0.2%	3.8	0.1%
		Other Rolling, Casting & Extruding (non-ferrous) - 299	4.4	0.2%	3.7	0.1%
		Steel Foundries - 2912	1.3	0.1%	1.9	0.1%
		Copper Alloy, Roll, Cast & Extruding - 297	1.3	0.1%	1.7	0.1%
		Total Foundries	24.2	1.0%	25.6	0.9%
9	General Manufacturing	Glass & Glass Products - 356	14.2	0.6%	13.9	0.5%
		Category 3 (31 sectors) (3)	230.6	9.1%	259.4	9.3%
		Total General Manufacturing	244.8	9.7%	273.3	9.8%
10	Lime	Lime - 3581	14.7	0.6%	15.6	0.6%
11	Mining (4)	Metal Mining - 061	101.5	4.1%	91.2	3.3%
		Non Ferrous S & R - 295 (Less Aluminum)	84.8	3.4%	72.1	2.6%
		Total Mining / Smelting & Refining	186.3	7.5%	163.3	5.9%

continued next page

continued

FIGURE

12

Sectors with CIPEC Task Forces

Task Force	Sector	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
12 Petroleum Refining (5)	Petroleum Refining - 3611	303.1	12.1%	296.7	10.8%
	Oil Sands / Upgrader - 712	130.9	5.2%	177.5	6.5%
	Total Petroleum Refining	434.0	17.3%	474.3	17.3%
13 Plastics*	Plastics Products - 16	12.0	0.5%	13.3	0.5%
14 Pulp & Paper	P & P - 271	748.5	29.9%	848.5	30.9%
15 Rubber*	Rubber Products - 15	9.1	0.4%	10.4	0.4%
16 Steel	Steel - 2919	207.8 (6)	8.3%	236.4	8.6%
17 Textiles (7)	Primary Textiles - 18	14.3	0.6%	25.7	0.9%
	Textile Products - 19	6.7	0.3%	9.8	0.4%
	Total Textiles	21.0	0.8%	35.5	1.3%
18 Transportation	Motor Vehicle Parts - 325	22.2	0.9%	24.9	0.9%
	Motor Vehicles - 3231	18.8	0.7%	24.9	0.9%
1994 Data					
	Aircraft & Aircraft Parts - 321	5.0	0.2%	5.3	0.2%
	Railroad Rolling Stock - 326	2.5	0.1%	1.8	0.1%
	Truck & Bus Trailer - 324	1.6	0.1%	1.8	0.1%
	Shipbuilding & Repair - 327	1.6	0.1%	1.1	0.0%
	Boatbuilding & Repair - 328	0.2	0.0%	0.5	0.0%
	Other Transportation Equipment - 329	0.2	0.0%	0.4	0.0%
	Total Transportation	50.8	2.0%	60.0	2.2%
19 Wood Products (8)	Wood Industries - 25	39.3	1.6%	56.1	2.0%
	Subtotal	2,304.4	90.9%	2,576.3	92%
Other Sectors	Chemical Products - 37	216.9	8.6%	204.2	7.3%
	Non-Metal Mining (less Potash) - 62	12.7	0.5%	11.9	0.4%
Total (9)		2,534.1	100.0%	2,792.4	100.0%

* Operational in 1997

1. The Cement Task Force uses lower heating values. StatsCan uses higher heating values.
2. The National Dairy Council is reviewing the energy use data for the dairy sector, in particular the data for 1990.
3. Data for General Manufacturing Category 3 sectors for 1990 and 1994 are estimated.
4. The Mining Task Force will work with NRCan, StatsCan and CIEEDAC to reconcile various surveys involving the mining and smelting industries and to develop criteria to more accurately allocate energy use among those sectors.
5. For international comparison purposes, the Petroleum Refining Task Force uses lower heating values for refined petroleum products, while StatsCan uses higher heating values. The refinery industry also uses Solomon Associates of Houston, Texas to evaluate each refinery against an international industry standard. The Petroleum Refining Task Force uses lower heating values for the oil sands, while StatsCan uses higher heating values.
6. StatsCan 1990 data for the steel sector do not reflect a 5 month strike in that year. The Sector Task Force has adjusted the 1990 energy use number to 219.3 PJ to reflect what the energy use would have been if the strike had not occurred.
7. The Textiles Task Force believes that the 1995 data provided to StatsCan by companies in the textile subsectors were inaccurate, hence they should not be used to measure the performance of the primary textiles and textiles products sectors.
8. Both CIEEDAC and the Wood Task Force are aware that the energy data for the Wood Products Sector needs to be refined.
9. Some of the energy use identified in Figure 13 above is based on 1994 data. When this amount is added to the 1995 data of other sectors, the total is not exactly the same as the 1995 total for manufacturing and mining.

Sectors Without Task Forces

The Chemical Products Sector, representing 7.4 per cent of industrial energy use, is the only significant sector which has yet to establish a CIPEC Task Force.

The Non-Metal Mining sector, excluding Potash mining, likewise does not yet have a Task Force. This sector only consumes about 0.4 per cent of manufacturing and mining energy, however.

Whether additional Sector Task Forces are needed is questionable, given the amount of energy the remaining sectors consume.

Category 1

Sectors and Task Forces

Physical Energy Intensity (PEI)

(PEI = Energy used by stationary industrial sources
of a sector divided by the units of production of that sector)



Category 1 Sectors

Energy use and physical units of production are available for 17 sectors, enabling the physical energy intensity - PEI - of these sectors to be calculated.

Together, these 17 sectors, represented 76.8 per cent of total manufacturing and mining energy consumption in 1995, up from 75.2 per cent in 1990.

Figure 13 ranks the energy used by each sector in 1990 and 1995. It also shows the average annual physical energy intensity for each sector as well as its weighted annual average physical energy intensity. In total, comparing 1995 with 1990, the weighted annual average PEI of these 17 sectors was 0.84 per cent.

FIGURE

13

Category 1 Sectors: Energy Use, Weighted Physical Energy Intensity and Average Annual Physical Energy Intensity Performance: 1990 through 1995

#	Sector / SIC	1990 Energy (PJ)	Energy as % of Total	1995 Energy (PJ)	Energy as % of Total	1990 to 1995 Annual Av. PEI	Weighted Annual Average
1	Pulp & Paper - 271	748.5	29.92%	848.5	30.86%	1.6%	0.48%
2	Petroleum Refining - 3611 (1)	303.1	12.12%	296.7	10.79%	0.2%	0.03%
3	Steel - 2919 (2)	207.8	8.31%	236.4	8.60%	1.3%	0.11%
4	Oil Sands / Upgrader - 712 (2)	130.9	5.23%	177.5	6.46%	2.8%	0.15%
5	Aluminum - 2951	113.9	4.55%	152.0	5.53%	0.9%	0.04%
6	Metal Mining - 061 (3)	101.5	4.06%	91.2	3.32%	0.9%	0.04%
7	Inorganic Chemicals - 3711	71.4	2.85%	73.2	2.66%	0.2%	0.01%
8	Cement - 3521 (4)	60.0	2.40%	60.6	2.20%	0.5%	0.01%
9	Agricultural Chemicals - 372	42.6	1.70%	57.7	2.10%	-5.9%	-0.10%
10	Potash - 0624	27.4	1.10%	31.8	1.16%	2.1%	0.02%
11	Plastic & Resins - 3731	17.4	0.69%	28.3	1.03%	-5.0%	-0.03%
12	Motor Vehicles - 3231	18.8	0.75%	24.9	0.90%	-1.4%	-0.01%
13	Lime - 3581	14.7	0.59%	15.6	0.57%	2.3%	0.01%
14	Meat & Poultry - 101	15.4	0.62%	10.7	0.39%	7.6%	0.05%
15	Brewery Products - 1131	7.1	0.28%	6.2	0.23%	3.1%	0.01%
16	Peat Industry - 622	0.7	0.03%	0.8	0.03%	5.8%	0.02%
17	Gypsum Mines - 623	0.6	0.02%	0.5	0.02%	2.7%	0.001%
Subtotal		1,881.8	75.2%	2,112.6	76.8%	1.2%	0.84%
Total M / M		2,501.9		2,749.3			

- For international comparison purposes, the petroleum industry and the Petroleum Products Task Force use lower heating values for refined petroleum products and for oil sands, while StatsCan uses higher heating values.
- StatsCan 1990 data for the steel sector do not reflect a 5 month strike in that year. The Sector Task Force has adjusted the 1990 energy use number to 219.3 PJ to reflect what the energy use would have been if the strike had not occurred.
- The Mining Task Force will be working with NRCan, StatsCan and CIEEADAC to reconcile various surveys involving the mining and smelting and refining industries and to develop criteria to more accurately allocate energy use among those sectors.
- The Cement Task Force is concerned with StatsCan's cement production data. In addition, the Cement Task Force uses lower heating values, while StatsCan uses higher heating values. As a result, the StatsCan energy use data differs from industry data.

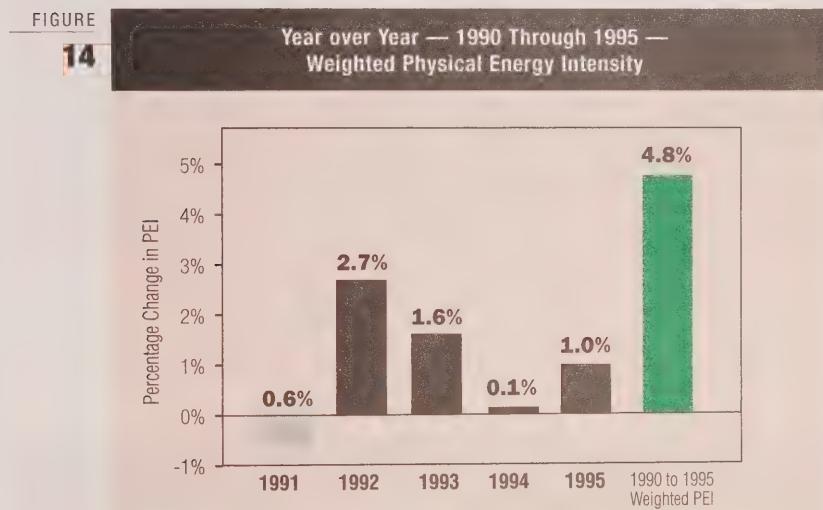
Manufacturing and Mining's Commitment

In 1994, manufacturing and mining Task Forces committed to an overall one per cent reduction per year in energy consumption per unit of production between 1995 and 2000, a 5 per cent cumulative reduction over the period.

When the physical energy intensities of 17 sectors are compared in each year - 1991, 1992, 1993, 1994 and 1995 against the preceding year, the cumulative physical energy intensity of the period 1990 through 1995 was reduced by 4.8 per cent. See Figure 14.

This methodology for determining manufacturing and mining's PEI is the best available at this time. CIEEDAC and NRCan, however, are investigating alternative methodologies.

A sector's PEI can be significantly affected by how efficient the sector's plants are at various levels of production. This in turn may be affected by the sector's GDP growth rate. For a comparison with industrial GDP over the period 1990 to 1995, see Figure 6, page 15.



Category 1 Sector Task Forces

Nine Category 1 Sector Task Forces are now in place. These Task Forces relate to 10 sectors, representing 69.5 per cent of total manufacturing and mining energy use in 1995, up slightly from 1990 and are listed alphabetically in Figure 15.

FIGURE

15

Category 1 Sector Task Forces Operational in 1996

#	Task Forces	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total	Ann. PEI
1	Aluminum	Aluminum - 2951	113.9	4.6%	152.0	5.5%	0.9%
2	Brewery	Brewery Products - 1131	7.1	0.3%	6.2	0.2%	3.1%
3	Cement (1)	Cement - 3521	59.9	2.4%	60.6	2.2%	0.5%
4	Lime	Lime - 3581	14.7	0.6%	15.6	0.6%	2.3%
5	Mining (2)	Metal Mining - 061	101.5	4.1%	91.2	3.3%	0.9%
6	Petrol. Products (3)	Petroleum Refining - 3611	303.1	12.1%	296.7	10.8%	0.2%
		Oil Sands / Upgrader - 712	130.9	5.2%	177.5	6.5%	2.8%
7	Pulp & Paper	Pulp & Paper - 271	748.5	29.9%	848.5	30.9%	1.6%
8	Steel (4)	Steel - 2919	207.8	8.3%	236.4	8.6%	0.3%
9	Transportation	Motor Vehicles - 3231	18.8	0.7%	24.9	0.9%	-1.4%
	Subtotal		1,706.3	68.2%	1,909.7	69.5%	
	Remaining M/M Sectors		795.7	31.8%	839.6	30.5%	
	Total M/M		2,502.0	100%	2,749.3	100%	

1. The Cement Task Force is concerned with StatsCan's cement production data. In addition, the Cement Task Force uses lower heating values, while StatsCan uses higher heating values. As a result, StatsCan's energy use data differ from industry data.
2. The Mining Task Force will work with NRCan, StatsCan and CIEEDAC to reconcile various surveys involving the mining and smelting and refining industries and to develop criteria to more accurately allocate energy use among those sectors.
3. For international comparison purposes, the petroleum industry and the Petroleum Product Task Force use lower heating values for refined petroleum products and oil sands, while StatsCan uses higher heating values.
4. StatsCan 1990 data for the steel sector do not reflect a 5 month strike in that year. The Sector Task Force has adjusted the 1990 energy use number to 219.3 PJ to reflect what the energy use would have been if the strike had not occurred.

Two Category 1 Sector Task Forces, involving three sectors, representing about 3.6 per cent of total energy consumption in 1995, will become operational in 1997. See Figure 16.

FIGURE

16

Category 1 Sector Task Forces Operational in 1997

#	Category 1 Sectors	1990 Energy (PJ)	% of Subtotal	1995 Energy (PJ)	% of Subtotal	90 vs. 95 PEI	Ann. Av. PEI
Chemical Fertilizers							
1	Agricultural Chemicals - 372	42.6	1.7%	57.7	2.1%	0.579	-5.9
	Potash - 0624	27.4	1.1%	31.8	1.2%	0.895	2.1%
Food Processing							
2	Meat & Poultry - 101	15.4	0.6%	10.7	0.4%	0.619	7.6%
	Total	85.4	3.4%	100.1	3.6%		

Two Category 1 sectors - Inorganic Chemicals and Plastic & Resins, representing 3.7 per cent of total manufacturing and mining energy use - do not yet have their Sector Task Forces in place.

CATEGORY 1 PHYSICAL ENERGY INTENSITY

SECTOR TASK FORCE REPORTS

	SIC	Page
● Aluminum (Primary)	2951	30
● Brewery Products	1131	32
● Cement	3521	35
● Lime	3581	40
● Metal Mining	61	43
● Petroleum Products		47
Refined Petroleum Products	3611	48
Oil Sands / Upgrader	712	49
● Pulp & Paper	271	52
● Steel	2919	56
● Transportation Equipment Industry	32	61

Aluminum (PRIMARY)

SIC 2851

In 1995, Canada's primary aluminum producers consumed 5.5 per cent of total manufacturing and mining energy, making this sector the fifth largest energy user.

As Figure 17 illustrates, the aluminum sector's energy use increased between 1990 and 1995 by 33.5 per cent, while aluminum production increased by 39.7 per cent.

FIGURE

17

	1990	1991	1992	1993	1994	1995	% Change
Total Energy Use (Terajoules)	113,897	133,183	140,847	156,745	153,291	152,003	33.5%
Aluminum Production (tonnes)	1,554,753	1,821,642	1,971,843	2,304,700	2,254,683	2,171,992	39.7%
Energy / Production (TJ/tonne)	0.07326	0.07311	0.07143	0.06801	0.06799	0.06998	
Energy / Production Indexed	1	0.998	0.975	0.928	0.928	0.955	

Physical Energy Intensity

As a result, aluminum producers improved their physical energy intensity so that they used 4.5 per cent less energy per unit of production in 1995 than in 1990. See Figure 18.

FIGURE

18

Primary Aluminum Energy Intensity / Production Index and Physical Energy Intensity



Energy Forms

Figure 19 shows the different amounts and forms of energy used by primary aluminum producers between 1990 and 1995.

Electricity is the predominant energy fuel representing over 92 per cent of total consumption. The use of all other fuel types fell over the period.

**FIGURE
19**

Energy Consumption by Type of Energy: 1990 to 1995									
Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Electricity	100,256	118,266	124,968	141,467	137,130	139,979	39.6%	88.0%	92.1%
Natural Gas	8,727	10,100	9,735	10,490	11,031	9,334	7.0%	7.7%	6.1%
Heavy Fuel Oil	4,038	3,856	4,345	3,704	3,757	2,463	-39.0%	3.5%	1.6%
Middle Distillates	742	933	1,637	1,035	1,336	212	-71.4%	0.7%	0.1%
Liquid Petroleum Gases	132	26	43	47	35	12	-90.9%	0.1%	0.01%
Total Energy	113,895	133,181	140,728	156,743	153,289	152,000	33.5%		

Industrial Energy Innovators, VCR Registration and Action Plans

All of Canada's primary aluminum producers have become Industrial Energy Innovators and are registered with the Voluntary Challenge Registry (VCR). All have submitted action plans to the VCR.

Case Studies

In the past year, Canada's primary aluminum producers have undertaken a variety of activities to boost their already strong physical energy intensity performance, including:

- replacing conventional cathode blocks in the electrolysis pots with graphite blocks. This allows the voltage in the pot to be increased and thereby producing more aluminum with less energy;
- employee training programs; and,
- replacing motors.

Primary Aluminum Task Force

Christian Van Houtte, Aluminum Industry Association, Chairman.

Physical Energy Intensity Commitment: 1995 - 2000

The aluminum sector is committed to improving its physical energy intensity by 1.0 per cent per year for the period 1995 to 2000.

Brewery Products

SIC 1131

Industry Background

There were 25 conventional breweries in Canada in 1996.

Rationalization continues to take place with the closing of less efficient plants. Production continued to increase modestly.

Canada's conventional breweries produced about 90 per cent of total beer production.

Energy Use

In 1995, these breweries consumed 0.2 per cent of total manufacturing and mining energy, making them the thirty-third largest industrial energy user.

Energy use was reduced by 12.8 per cent, while beer production increased by 3.1 per cent between 1990 and 1995. See Figure 20.

FIGURE
20

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Energy Use (Terajoules)	7,130	6,514	6,770	6,309	6,605	6,217	-12.8%
Production (millions) hectolitres	23.92	22.64	22.09	23.54	24.38	24.67	3.1%
Energy / Production (TJ/HL)	0.00298	0.00288	0.00306	0.00268	0.00270	0.00252	
Energy / Production Indexed	1	0.97	1.03	0.90	0.91	0.85	

Physical Energy Intensity

Canada's breweries improved their physical energy intensity between 1990 and 1995 by 3.1 per cent per year. This means that it took 15 per cent less energy to produce a million hectolitres of beer in 1995 than it did in 1990. See Figure 21.

Energy Forms

Figure 22 shows the different amounts and forms of energy used by Canada's breweries between 1990 and 1995.

Natural gas and electricity were the predominant energy fuels, representing over 93 per cent of total consumption. Middle distillate consumption increased slightly, while consumption of liquid petroleum gases and heavy fuel oil fell over the period.

FIGURE

21

Brewery Products Energy / Production and Physical Energy Intensity

FIGURE

22

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	5,112	4,675	4,810	4,610	5,053	4,510	-11.8%	71.7%	72.5%
Electricity	1,394	1,390	1,481	1,420	1,343	1,313	-5.8%	19.6%	21.1%
Middle Distillates	115	25	75	155	88	139	20.9%	1.6%	2.2%
Heavy Fuel Oil	437	358	341	118	115	251	-42.6%	6.1%	4.0%
Liquid Petroleum Gases	69	64	61	4	4	1	-98.6%	1.0%	0.0%
Total Energy	7,130	6,514	6,770	6,309	6,605	6,217	-12.8%		

Industrial Energy Innovators, VCR Registration and Action Plans

The four largest Canadian breweries - Labatt, Molson, Moosehead and Sleeman - representing over 90 per cent of Canada's total beer production have committed to become Industrial Energy Innovators and all have submitted action plans. Three are registered in the Voluntary Challenge Registry (VCR).

Case Studies

In the past year, Canada's brewers have undertaken a variety of activities to boost their already strong physical energy intensity performance. Examples of these initiatives include:

Training

- specialized energy auditing training programs have been implemented through CIET (Canadian Institute for Energy Training) for 11 employees from five plants of one brewer;

Operations

- metering and tracking of energy use is being improved from a monthly to a weekly basis. The future goal is to report daily to area supervisors. This will aid in energy reduction and act as a framework for future internal comparisons of energy consumption;

- an energy management system to control the operation of all plant ventilation and air conditioning systems has been installed by a brewer;
- converting Freon 22 refrigeration to ammonia. This will result in a major saving in electricity. The system will program the most efficient way to vamping the refrigeration system to meet load requirements;

Communications

- The brewery's newsletters regularly include articles and information on energy efficiency.

Brewery Task Force

Ralph Backman, Labatt Breweries of Canada, Chairman

Vincent Donato, Molson Breweries

Peter Henneberry, Moosehead Breweries

Al Brash, Sleeman Breweries

Physical Energy Intensity Commitment: 1995 - 2000

The brewery sector is committed to improving its physical energy intensity by 3.0 per cent per year for the period 1995 to 2000.

Cement

SIC 3521

Cement Task Force Comment

The cement industry's energy use and production numbers for 1990 through 1995 differ from those recorded by Statistics Canada.

The most significant difference results from the conversion rate used to determine the energy content of various fuels and changes in inventory and the number of plants included in the StatsCan survey. The Cement industry uses lower heating values, while StatsCan uses higher heating values.

As well, there are significant differences between the industry's production data and that reported by StatsCan. Changes in clinker inventories account for some of these differences and are not captured in StatsCan data. (Clinker is semi-processed cement.)

Because of known plant efficiency improvements in this period, the industry data is accepted by the Task Force as being more accurate.

The following report shows both Statistics Canada and cement industry numbers.

Industry Background

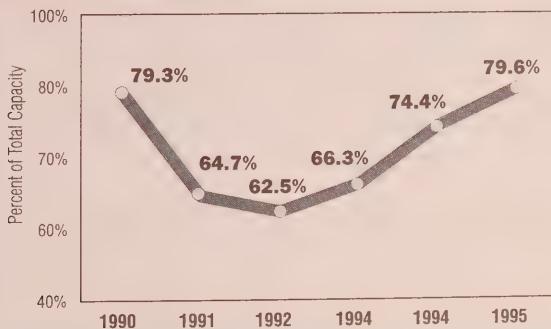
The cement sector is composed of seven companies. In 1995, it consumed 2.2 per cent of total industrial energy, making it the tenth largest industrial energy user.

Cement plants are located in all provinces except Saskatchewan, Manitoba, New Brunswick, and Prince Edward Island. Ontario accounts for about 47 per cent of total clinker production capacity. The industry employs about 2,300 people. In 1995, 43 per cent of total Canadian cement production was exported, mostly to US markets.

Capacity utilization varies widely from year to year, as illustrated in Figure 23. This means that when additional production is required older, less energy efficient, plants are placed in service. No new production facilities are anticipated before 2008. One wet-process plant in Quebec will be closed in 1997.

**FIGURE
23**

Cement Industry's Capacity Utilization



Over the past 25 years, the Canadian cement industry has made extensive progress in improving physical energy intensity, primarily through major process changes, e.g., changing from a wet to dry process (preheater / precalciner), combined with a range of other minor process improvements.

Physical energy intensity improvements were made in the late 1980's through extensive capital investments in new technology, which extended capital cycles. Current efficiency gains have come mainly from improved operating practices.

In 1990, the average fuel consumption was 4.5 gigajoule (GJ) / tonne of clinker. In 2000, it is expected that this will be reduced by 8 to 10 per cent and by 2010, it is expected that there will be a further 8 per cent improvement.

Energy Use - Industry Data

Figure 24 compares the energy use and clinker production for the years 1990 through 1995 based on industry data. Specifically, 4.9 per cent more energy was used in 1995 than in 1990, but production was 11.2 per cent higher in 1995.

Note that the industry production data is for clinker, while StatsCan data shown later is for cement production. Because of wide swings of clinker inventory, the industry believes that cement production is not a good denominator (measure) for determining the physical energy intensity of the cement sector.

As of January 1, 1997, StatsCan began to collect data on clinker production.

FIGURE
24

Industry Data							
	1990	1991	1992	1993	1994	1995	90 vs. 95 % Change
Total Energy Use (Terajoules)	52,575	42,004	41,929	40,945	49,035	55,144	4.9%
Clinker Production (KT)	10,491	8,614	8,613	8,808	10,391	11,661	11.2%
Energy / Production (TJ/KT)	0.00501	0.00488	0.00487	0.00465	0.00472	0.00473	
Energy / Production Indexed	1	0.973	0.971	0.928	0.942	0.944	

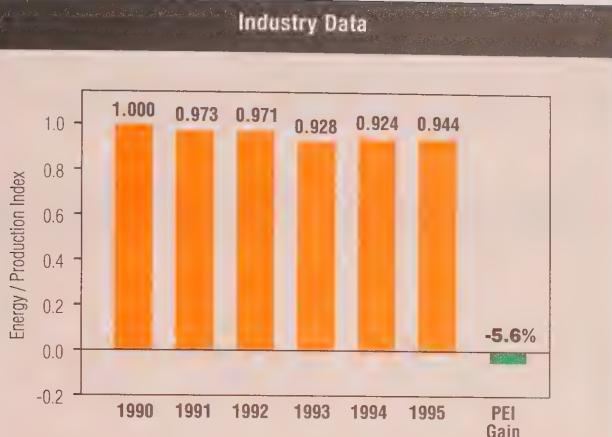
Source: Industry Surveys: 1990 & 1991 18 of 19 plants; 1992 & 1993 16 of 17 plants; 1994 & 1995 17 of 17 plants

Physical Energy Intensity - Industry Data

Based on industry data, the sector achieved a 5.6 per cent physical energy intensity improvement between 1990 and 1995. In other words, it took 5.6 per cent less energy to produce a million tonnes of clinker in 1995 than it did in 1990. See Figure 25.

This was achieved despite a sluggish economy, a slow-down in infrastructure and other construction activity and mandated increased use of electricity for environmental abatement, estimated to be about 2 per cent.

FIGURE
25



Energy Forms - Industry Data

Figure 26 shows the different amounts and forms of energy used by the cement sector between 1990 and 1995. Coal, natural gas and petroleum coke became slightly less important fuels, with waste fuel making a small but increasingly important contribution.

FIGURE
26

Energy Consumption by Type of Energy: 1990 to 1995 (Industry Data)

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change	1990	1995
							90 vs. 95	% of Total	% of Total
Coal	22,871	18,532	19,211	17,987	21,383	23,148	1.2%	43.5%	42.0%
Natural Gas	13,678	11,484	9,985	9,740	10,769	13,114	-4.1%	26.0%	23.8%
Petroleum Coke	7,059	5,080	5,043	4,446	4,473	6,957	-1.4%	13.4%	12.6%
Electricity	5,864	4,818	5,422	5,121	6,051	6,461	10.2%	11.2%	11.7%
Waste Fuels	1,563	731	1,168	2,186	4,442	3,764	140.8%	3.0%	6.8%
Residual Oil	1,129	1,015	769	1,151	1,611	1,376	21.8%	2.1%	2.5%
Middle Distillates	370	308	302	285	269	299	-19.2%	0.7%	0.5%
Gasoline	21	21	18	19	20	13	-35.5%	0.0%	0.0%
Liquid Petroleum Gases	20	15	13	10	15	13	-37.1%	0.0%	0.0%
Total Energy	52,575	42,004	41,930	40,945	49,035	55,144	4.9%		

Source: Industry Surveys: 1990 & 1991 18 of 19 plants; 1992 & 1993 16 of 17 plants; 1994 & 1995 17 of 17 plants

Energy Use - StatsCan Data

StatsCan data indicates that cement production declined from 11.5 million tonnes in 1990, to 9.6 million tonnes in 1992 and then rebounded to 11.9 million tonnes in 1995, a 3.4 per cent increase in production. Energy use increased by 1.0 per cent over the same period.

FIGURE
27

Industry Data

	1990	1991	1992	1993	1994	1,995	90 vs. 95 % Change
Total Energy Use (Terajoules)	60,004	52,584	47,746	46,875	54,995	60,609	1.0%
Cement Production (KT)	11,543	9,927	9,601	10,168	11,437	11,933	3.4%
Energy / Production (TJ/KT)	0.00520	0.00530	0.00497	0.00461	0.00481	0.00508	
Energy / Production Indexed	1	1.019	0.957	0.887	0.925	0.977	

Physical Energy Intensity - StatsCan Data

StatsCan's data also suggests that cement companies used 2.3 per cent less energy in 1995 than in 1990 to produce a tonne of cement. See Figure 28.

FIGURE
28

StatsCan data Cement Industry's Physical Energy Intensity: 1990 to 1995



Energy Forms - StatsCan Data

Figure 29 shows that StatsCan data in some areas are somewhat comparable to industry data but differs in other areas. For example, StatsCan shows heavy fuel oil and coke being consumed. Industry does not. Similarly, industry shows the use of gasoline, StatsCan does not.

FIGURE
29

Energy Consumption by Type of Energy: 1990 to 1995 (StatsCan Data)

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Coal	23,859	19,150	19,716	20,826	23,017	23,824	-0.1%	39.8%	39.4%
Natural Gas	16,805	14,814	13,106	12,676	12,423	14,731	-12.3%	28.0%	24.4%
Petroleum Coke	7,845	7,837	3,386	3,242	6,839	8,720	11.2%	13.1%	14.4%
Electricity	5,745	5,999	5,778	5,850	6,244	6,544	13.9%	9.6%	10.8%
Waste Fuels	1,563	731	1,167	2,185	4,442	3,764	140.8%	2.6%	6.2%
Heavy Fuel Oil	3,012	1,710	2,341	1,702	1,484	1,940	-35.6%	5.0%	3.2%
Coke	1,067	2,210	2,146	294	272	860	-19.4%	1.8%	1.4%
Middle Distillates	92	114	80	64	234	79	-14.1%	0.2%	0.1%
Liquid Petroleum Gases	15	15	23	33	37	0	-100.0%	0.0%	0.0%
Total Energy	60,004	52,584	47,746	46,875	54,995	60,609	0.8%		

Industrial Energy Innovators, VCR Registration and Action Plans

Canada's seven cement companies - ESSROC Canada Inc., Lafarge Cement Inc., North Star Cement, St. Lawrence Cement, St. Mary's Cement Corporation, Tilbury Cement Ltd. and Inland Cement, - representing 93 per cent of Canada's total clinker production have committed to become Industrial Energy Innovators and have submitted action plans.

All seven are registered with the Voluntary Challenge Registry (VCR).

Case Studies

Examples of changes which improved the physical energy intensity of the cement industry during the period 1989 and 1994, include:

- the closing of a 300,000 tonne / year plant in Winnipeg and a 200,000 tonne / year plant in Regina, both plants were based on old technology
- the retirement of a 150,000 tonne / year dry kiln in Exshaw, Alberta and two 170,000 tonne / year long dry kilns in Picton, Ontario
- the replacement of two 300,000 tonne/year wet kilns with a 1.4 million tonne / year preheater/precalciner kiln in Bowmanville, Ontario
- many modifications in process equipment and operating procedures.

Cement Task Force

John Lind, St. Mary's Cement Company, Chairman

Physical Energy Intensity Commitment: 1995 - 2000

The cement sector is committed to improving its physical energy intensity by 0.7 per cent per year for the period 1995 to 2000, largely through reductions in fossil fuels per unit of production.

Lime Industry

SIC 3581

Industry Background

The lime sector comprises 12 companies, operating 19 plants with an annual rated capacity of approximately 3.5 million tonnes. Nine of the 19 plants are in Ontario. The industry employs 800 people directly.

There are two basic end-use markets for Canadian lime production - "captive" markets where lime is a secondary product and consumed internally by a small number of chemical, steel and sugar producers, and "merchant" markets where lime is sold to end-users by 12 mainstream lime producers. These mainstream producers represent 91 per cent of industry capacity. Net exports of lime account for 8.5 per cent of total Canadian production.

This report focuses on the 12 mainstream "merchant" producers. Energy consumed in "captive" plants is reported as part of the related SIC category, e.g., chemical, steel, etc.

Energy Use

Lime production consumed 0.6 per cent of Canada's industrial energy in 1995, making this the twentieth largest industrial energy user.

Figure 30 below compares the total energy use and production for the years 1990 through 1995. In essence, the sector used 6 per cent more energy in 1995 than it did in 1990 but produced 19.5 per cent more product.

FIGURE

30

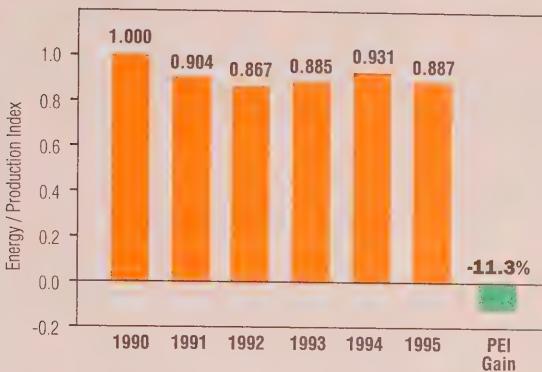
	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	14,738	13,214	12,798	13,282	14,544	15,625	6.0%
Production (KT)	1,848	1,833	1,851	1,882	1,959	2,209	19.5%
Energy / Production (TJ/KT)	0.008	0.007	0.007	0.007	0.007	0.007	
Energy / Production Indexed	1	0.904	0.867	0.885	0.931	0.887	

Physical Energy Intensity

Figure 31 illustrates that the lime sector improved its physical energy intensity so that it used 11 per cent less energy in 1995 to produce a tonne of lime than it did in 1990.

**FIGURE
31**

Lime Industry Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 32 shows the different amounts and forms of energy used by Canada's lime sector between 1990 and 1995.

Natural gas, petroleum coke and coal were by far the most important energy forms used by the lime sector in 1995, representing, together, 86 per cent of the total energy used.

**FIGURE
32**

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	6,745	6,325	6,700	6,750	7,054	7,533	11.7%	45.8%	48.2%
Petroleum Coke	3,053	2,556	2,178	2,594	3,519	3,241	6.2%	20.7%	20.7%
Coal	3,041	2,651	2,335	2,771	2,619	2,749	-9.6%	20.6%	17.6%
Heavy Fuel Oil	1,289	1,070	959	545	746	1,146	-11.1%	8.7%	7.3%
Electricity	570	565	590	579	571	628	10.2%	3.9%	4.0%
Middle Distillates	29	25	25	31	28	73	151.7%	0.2%	0.5%
Liquid Petroleum Gases	8	19	8	8	3	0	-100.0%	0.1%	0.0%
Total Energy	14,738	13,214	12,798	13,282	14,544	15,625	6.0%		

Industrial Energy Innovators, VCR Registration and Action Plans

Five of Canada's lime companies, representing 53 per cent of total lime production, have committed to become Industrial Energy Innovators. A sixth company has registered direct with the Voluntary Challenge Registry (VCR). Of these companies, four have submitted action plans to the VCR.

The sector has set a goal to broaden company participation in the Industrial Energy Innovator program from the current five companies to nine.

Case Studies

Over the past year, the following physical energy intensity initiatives were taken by companies in the lime sector:

Chemical Lime

Project: Ongoing investments in new equipment and modifications to existing equipment.
Savings: 14 per cent equipment efficiency at the Quicklime operation and 240 per cent equipment efficiency at the Dried Limestone operation.

Global Stone

Project: Lighting retrofit within primary crusher, quarry belt and crusher building area, replacing incandescent fixtures with holophane and high pressure sodium fixtures.
Savings: Annual savings of 107,800 Kwh or a 77 per cent reduction.

Graybec

Project: Currently investing \$125,000 in new high efficiency I.D. fan at the kiln site
Savings: Reduction in HP required from 600 HP to 300 HP.

Havelock Lime

Project: Installed a variable frequency drive on a 300 HP kiln fan representing a \$50,000 investment
Savings: Annual savings of 558,000 Kwh or an 8 per cent reduction.

Lime Task Force

Dick Bowman, Global Stone (Ingersoll) Ltd. Chairman

Lime Physical Energy Intensity Commitment: 1996 - 2000

The lime sector is committed to improving its annual physical energy intensity by 1.0 per cent for the period 1996 to 2000.

Metal Mining

SIC 61

Industry Background

Canada's metal mining sector, which includes gold, base metals and iron mines, is the seventh largest industrial energy user, consuming 3.3 per cent of Canada's total industrial energy.

Canada is a world leader in high-tech mining. The industry invests more than \$100 million annually in research and development; 85 per cent of the workforce uses advanced technology.

Metal mining represents a range of non-homogeneous products, production methods and energy mixes. The polymetallic nature of Canadian ore bodies may both enhance and impede energy efficiency. Significant energy efficiency progress in one sector may be statistically undermined by another sector which is not experiencing the same economic conditions.

Energy Use Statistics

CIPEC's 1990 to 1994 reports were based on Statistics Canada's Industrial Consumption of Energy (ICE) survey. The ICE survey is based on a statistically valid sample and then extrapolated to represent companies in the entire SIC 61 sector.

Starting in 1995, the data for the metal mining sector are based on the Annual Survey of Mines. The more complete results from the Survey of Mines over the ICE Survey results ensures a more comprehensive picture of physical energy intensity performance. The data for 1990 through 1995 has been revised accordingly.

Energy Use

Energy use decreased by 10.1 per cent between 1990 and 1995, while metal production decreased by 6.0 per cent. See Figure 33.

FIGURE

33

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	101,502	95,264	86,229	80,903	84,128	91,215	-10.1%
Production (KT)	282,475	271,528	248,746	227,633	229,957	265,545	-6.0%
Energy / Production (TJ/KT)	0.00036	0.00035	0.00035	0.00036	0.00037	0.00034	
Energy / Production Indexed	1	0.976	0.965	0.989	1.018	0.956	

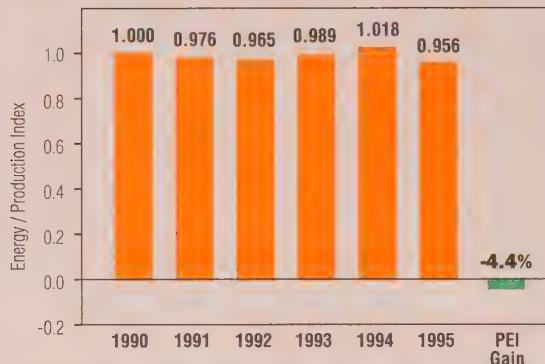
Source: Survey of Mines, StatsCan., CIEEDAC

Physical Energy Intensity

The physical energy intensity of Canada's metal mining industry improved so that it took 4.4 per cent less energy per unit of production in 1995 than it did in 1990. See Figure 34.

FIGURE
34

Metal Mining Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 35 shows the different amounts and forms of energy used by Canada's metal mining industry between 1990 and 1995.

Specifically, electricity was the most prominent energy fuel, with heavy fuel oil, middle distillates and coke making up most of the remainder. Coal and natural gas demand fell somewhat over the period.

FIGURE
35

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Electricity	47,150	44,603	40,848	38,674	38,537	44,618	-5.4%	46.5%	48.9%
Heavy Fuel Oil	15,184	15,194	14,415	13,838	15,570	13,601	-10.4%	15.0%	14.9%
Middle Distillates	16,494	16,282	13,480	11,686	11,727	13,352	-19.0%	16.2%	14.6%
Coke	7,085	6,486	7,974	8,375	9,495	10,238	44.5%	7.0%	11.2%
Natural Gas	6,518	13,293	5,081	4,642	4,122	4,275	-34.4%	6.4%	4.7%
Liquid Petroleum Gases	3,216	3,005	2,715	2,675	2,930	3,217	0.0%	3.2%	3.5%
Coal	5,581	4,473	1,933	1,405	957	1,407	-74.8%	5.5%	1.5%
Steam	270	137	216	125	635	573	112.2%	0.3%	0.6%
Total Energy	101,502	95,264	86,229	80,903	84,128	91,215	-10.1%		

Over the coming year, the Task Force will be working with NRCan, StatsCan and CIEEDAC to reconcile various surveys involving the mining and smelting and refining industries and to develop criteria to more accurately allocate energy use among those sectors.

Industrial Energy Innovators, VCR Registration and Action Plans

Thirteen metal mining companies have committed to become Industrial Energy Innovators and have registered with the Voluntary Challenge Registry (VCR). Of these companies, seven have submitted action plans to the VCR.

Case Studies

Echo Bay Mines Ltd., Lupin Operation

Project: The company introduced a powerhouse computer data logging system to control its electrical and mechanical efficiencies. In addition, the company is replacing incandescent lighting with special florescent lamps. Washroom lights have been fitted with time switches and offices fitted with motion sensor lighting switches. Underground ventilation fans in drifts and headings are switched off when the mine is not in operation. Compressed air leaks are monitored and corrective action is taken.

Savings: In 1990, Echo Bay's annual average energy use for all of its diesel generators was 17.44 kilowatts per gallon. Over the past six years this has decreased by 3.3 per cent so that now 18.01 kilowatts are produced per gallon. This represents an annual savings of 698,616 gallons of fuel worth over \$1.4 million.

Hillsborough Resources Ltd.

Project: The company meters and tracks its energy costs. It has revised its maintenance / operational practices and invested in small and large capital replacement / improvement initiatives. In addition, it has engaged in a variety of program support activities including staff education and training, dedicated internal and external energy efficiency communications, special events and promotion and recognition of actions and successes.

Savings: In the first four months of 1996, electricity consumption savings per tonne of clean coal amounted to 13.3 per cent.

Future: The company plans to replace older equipment, for example, its underground pumps, with more efficient equipment.

Westmin Resources Limited, Myra Falls Operation

Project: Since 1991, Myra Falls has undertaken a number of energy efficiency initiatives, including:

- replacing two 800 HP main underground mine fans with two 500 HP energy efficient fans, resulting in a savings of 3.29 gwh/year;
- compressed air pressure was reduced from 122 psi to 112 psi - an 8 per cent reduction as a result of air leak repairs and optimization of compressor cycling resulting in significant power saving;,
- valves and leaks of its compressed air system were repaired, resulting in power savings of approximately 1.76 gwh/year;
- ventilation fans are periodically shut down during non-working periods resulting in a power savings of approximately 7.95 gwh/year;
- the mill has reduced its pumping requirements by consolidated pump boxes and simplifying the floatation circuit. This has resulted in the elimination of a 500 HP pump and approximate power savings of 7.95 gwh/year;
- the Number 2 conveyor lighting system was reduced by half, after installing a different style of shades. This resulted in a power savings of 79 mwh/year;
- low efficiency electric water heaters have been replaced with high efficiency heaters;
- old diesel power generating units were replaced with high efficiency units, resulting in a 25 per cent improvement in the cost of producing a KWh of electricity;
- bus transportation has been provided to approximately 380 employees at a cost of \$1.5 million, reducing private automobile use by an estimated 18.9 million kilometres a year;
- a compressed work week (10 hour shifts, 4 days per week) has been introduced for most employees; and,
- a number of recycling programs have been put in place.

Metal Mining Task Force

Milt Goble, INCO Manitoba Division, Chairman
Peter McBride, Ontario Mining Association
Keith Eldridge, Iron Ore Company
Rick Geren, Noranda
Lauri Gregg, Falconbridge Ltd.

Anthony Howard, Echo Bay
Paul Huszti, Cominco Metals
John LeMay, INCO Ontario Division
Henry Smith, Williams Operating
Gerry Vallianotos, Falconbridge Ltd.
Kees Versfeld, Syncrude

Physical Energy Intensity Commitment: 1995 - 2000

The mining sector is committed to improving its annual physical energy intensity by 1.0 per cent for the period 1995 to 2000.

Petroleum Products

The Petroleum Products Task Force is responsible for, and reports on, two sectors:

- refined petroleum products - SIC 3611, and
- oil sands / upgrader - SIC 712.

The refined petroleum products sector supplies petroleum products to every segment of the economy through a supply network that spans the country from east to west and north to south. At the heart of the sector are 21 refineries that supply a network of distribution terminals, bulk plants and 15,000 retail outlets.

There are two oil sands plants in Canada located in northern Alberta and one heavy oil upgrader in Saskatchewan. Together they supply over 300,000 barrels per day of synthetic crude oil to markets in Canada and the United States.

The refined petroleum products and oil sands sectors, combined, employ over 120,000 Canadians directly and over 350,000 indirectly.

Highlights

Combined Refineries and Oil Sands:

- Energy per unit of output improved to 3.7 GJ/m³, or 97.7 per cent of the 1990 level.
- Carbon dioxide emissions decreased by 1 per cent between 1994 and 1995.

Refineries:

- Energy intensity improved, as measured by the Solomon Associates benchmark, by 11.63 per cent from 1990. 1995 performance was about 1 per cent better than 1994.
- Carbon dioxide emissions have decreased by 10.5 per cent since 1990. See page 138.
- Energy per unit of output improved to 2.682 GJ/m³, or 89.2 per cent of the 1990 level.

Oil Sands Upgraders:

- Energy use per unit of production improved to 8.943 GJ/M³, or 88.2 per cent of the 1990 level.
- Carbon dioxide emissions held level in 1995 despite a 5.4 per cent growth in production over the previous year.

Combined Petroleum Products Sectors - Physical Energy Intensity Continues to Improve

In the period 1990 to 1994, the energy use per unit of output of the combined petroleum products sectors improved by almost two per cent. This trend continued into 1995 - energy per unit of output stands at 3.723 GJ/M³, a 2.3 per cent improvement.

Total energy used increased to 421,533 TJ in 1995, a 0.53 per cent increase between 1994 and 1995 while production rose by almost twice that level - 0.97 per cent.

FIGURE
36

Petroleum Products Sector - Energy Profile

Combined	1990	1994	1995	% Change 90 vs. 94	% Change 90 vs. 95
Total Energy (TJ)	409,182	419,297	421,533	2.47%	3.02%
Energy / Production (GJ/m3)	3.812	3.739	3.723		
Index 1	0.981	0.977			
Refineries					
Energy (TJ)	287,972	257,481	253,185	-10.59%	-12.08%
Production (m3)	95,393	94,275	94,406	-1.17%	-1.03%
Energy / Production (GJ/m3)	3.019	2.731	2.682		
Index 1	0.905	0.892			
Solomon Index	114.5	102.3	101.2	-10.66%	-11.62%
Upgraders					
Energy (TJ)	121,210	161,817	168,348	33.50%	38.89%
Production (m3)	11,951	17,865	18,825	49.49%	57.52%
Energy / Production (GJ/m3)	10,142	9,058	8,943		
Index 1	0.893	0.882			

Refined Petroleum Products - SIC 3611

This sector measures itself against an internationally recognized benchmark - the Solomon Energy Intensity Index (EI) - to track its performance.

In 1995 the Canadian refining sector index stood at 101.2, an 11.6 per cent improvement since 1990 and a 1.1 per cent improvement over 1994, which is consistent with the sector's commitment to improve PEI by 1 per cent per year.

Between 1994 and 1995, energy consumption decreased by over 4,000 TJ, or 10.6 per cent, and energy use per unit of output decreased a further 1.4 per cent to 2.68 GJ/M3.

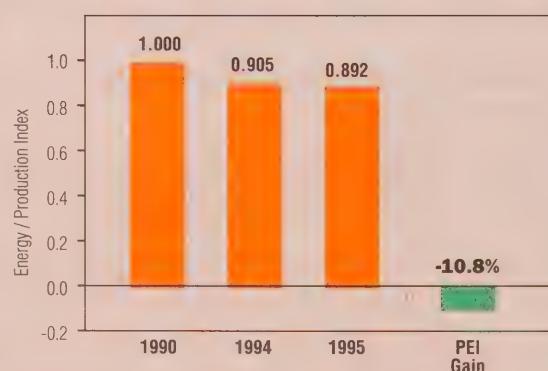
Key measures to improve the sector's physical energy intensity include: improved energy focus and operating reliability; improved measurement and control; heat integration projects; furnace upgrades and the installation of variable speed motors.

Figure 37 illustrates the 10.8 per cent physical energy intensity improvement that the refined petroleum sector achieved between 1990 and 1995.

FIGURE

37

Refined Petroleum Products Energy / Production Index and Physical Energy Intensity 1990 to 1995



Oil Sands / Upgrader - SIC 712

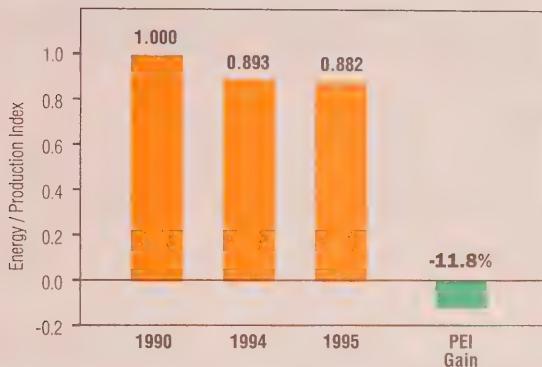
This sector continued to show strong production growth and reduced energy per unit of output.

Total production has risen by almost 58 per cent since 1990, while energy use increased by less than 40 per cent. This has resulted in an energy use per unit of output that has decreased by 12 per cent since 1990. In 1995 there was a 1.3 per cent improvement in energy use per unit of output over 1994.

FIGURE

38

Oil Sands Energy / Production Index
and Physical Energy Intensity 1990 to 1995



Aggressive plant reliability programs continue to reap benefits in terms of higher production and improved energy performance. New technology introduced in the mining stage of the oil sands operation has contributed significantly to reducing energy use per unit of output in the past year.

Figure 38 illustrates the 11.8 per cent physical energy intensity improvement that the oil sands sector achieved between 1990 and 1995.

Industrial Energy Innovators, VCR Registration and Action Plans

Nineteen of Canada's petroleum refineries representing over 90 per cent of Canada's total petroleum refining industry have committed to become Industrial Energy Innovators and have registered with the Voluntary Challenge Registry (VCR) and have submitted action plans to the VCR.

Case Studies

Key measures taken by the petroleum refining sector:

Energy Efficiency

- improved energy focus on operating reliability;
- improved measurement and control;
- heat integration projects;
- furnace upgrades; and,
- the installation of variable speed motors. At one location, savings of \$150,000 per year were realized by installing a variable speed drive on a draft fan.

Petroleum Products and Oil Sands / Upgrader Task Force

Peter Baltais, Imperial Oil Limited
Jack Burkholder, CIPEC, Secretariat Support
Bob Clapp, CPPI - National
Bruce Cater, Sunoco Group, Suncor Inc.
Burt Lang, Suncor Inc., Oilsands Group
Jim LeBlanc, Irving Oil Limited
Bob LeFlar, Parkland Refining Ltd.
Doug Mah, Consumers Co-op Refiners Ltd.
Dave McAfee, Petro-Canada
Pierre Moreau, Ultramar Canada Inc.
John Nyboer, CIEEDAC, Simon Fraser University
John Retallack, Novacor Chemicals (Canada)
Ron. Schmitz, Husky Oil Operations
Mike Stephen, Chevron Canada Limited
Nick Tremblay, Shell Canada Products Limited
Kees Versfield, Syncrude Canada Ltd.

Data Used In this Report

The petroleum products sector's energy use and energy intensity numbers for 1990 to 1995 used by the Task Force are consistent with those submitted to Solomon Associates of Houston, Texas.

Solomon's Energy Intensity Index is the refinery industry's international benchmark for petroleum products and differs from those recorded by Statistics Canada.

A significant difference between the Solomon Associates data and StatsCan's data is the conversion rate used to determine the energy content of various fuels and changes in inventory and the number of plants included in the survey. For international comparison purposes the petroleum industry uses lower heating values (LHV), while StatsCan uses higher heating values (HHV).

Efforts are underway to harmonize the Solomon calculations with those of StatsCan. When this work is complete, an addendum will be issued. In the meantime, the StatsCan data is shown below.

Petroleum Products Physical Energy Intensity

Commitment: 1995 - 2000

The Refined Petroleum Products sector is strongly committed to improving its annual physical energy intensity by 1.0 per cent, as measured by the Solomon Index, for the period 1995 to 2000.

The Oil Sands sector is also committed to improving its annual physical energy intensity by 1.0 per cent between 1995 and 2000.

StatsCan Data

Set out below is StatsCan's data on the petroleum products sectors. Unlike Solomon Associates, StatsCan uses high heating values (HHV) to calculate the amount of energy used.

Refined Petroleum Products - sic 361

Figure 39 below compares the energy use and refined petroleum production for the years 1990 and 1995, based on StatsCan data.

Energy use was reduced by slightly less than 2.0 per cent, while production was 1.0 per cent lower.

**FIGURE
39**

StatsCan Data

	1990	1991	1992	1993	1994	1995	90 vs. 95 % Change
Total Energy Use (Terajoules)	303,114	291,977	302,610	308,995	297,196	297,732	-1.8%
Production (m3)	95,398,619	92,460,565	90,267,514	92,777,114	94,275,005	94,406,088	-1.0%
Energy / Production (TJ/m3)	0.00318	0.00316	0.00335	0.00333	0.00315	0.00315	
Energy / Production Indexed	1	0.994	1.055	1.048	0.992	0.993	

Source: StatsCan, NRCan, CIEEDAC, Petroleum Refining Sector Task Force

Physical Energy Intensity

Based on StatsCan data, the petroleum refining sector's physical energy intensity (energy use divided by output, measured in cubic metres) improved by 0.7 per cent between 1990 and 1995.

Oil Sands/Upgrader - sic 712

Energy Use

StatsCan data for this sector is available only for 1990, 1994 and 1995. Synthetic crude oil production increased between 1990 and 1995 by over 57 per cent but energy use increased by just over 35 per cent.

**FIGURE
40**

StatsCan Data

	1990	1994	1995	90 vs. 95 % Change
Total Energy Use (Terajoules)	130,926	173,831	177,549	35.6%
Production (tonnes)	11,951,000	17,865,000	18,825,000	57.5%
Energy / Production (TJ/tonnes)	0.01096	0.00973	0.00943	
Energy / Production Indexed	1	0.888	0.861	

Source: StatsCan, NRCan, CIEEDAC, Petroleum Refining Sector Task Force

Physical Energy Intensity

As a result, the oil sands / upgrader physical energy intensity (energy use divided by output, measured in cubic metres) improved by a significant 13.9 per cent over the period, according to StatsCan data.

Pulp and Paper

SIC 271

Industry Background

The pulp and paper industry comprises 63 companies. It employs 247,000 people directly and another 741,000 indirectly. In 1995, it exported over 80 per cent of its production.

Canada's forest industry is Canada's largest employer. For some 350 communities the forest products industry is the main and, sometimes, the only local employer.

Energy Use

The pulp and paper industry consumed 31 per cent of Canada's total industrial energy in 1995.

Since this sector uses a significant and increasing amount of biomass energy which, for purposes of calculating carbon dioxide emissions is not counted, the sector's energy use is presented in two ways - all (total) energy forms and energy use not including biomass energy.

Figure 41 below compares the total energy use and production for the years 1990 through 1995. In essence, the sector used 13.4 per cent more energy in 1995 than in 1990 but produced 23.3 per cent more product.

FIGURE
41

Pulp and Paper Energy / Production Index (Including Biomass Energy)

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 Change
Total Energy Use (Terajoules)	748,496	750,950	756,756	754,496	846,471	848,512	13.4%
Production (KT)	25,619	25,842	26,749	28,370	31,004	31,596	23.3%
Energy / Production (TJ/KT)	29.216	29.059	28.291	26.595	27.302	26.855	
Energy / Production Index	1	0.995	0.968	0.910	0.934	0.919	

Source: StatsCan, NRCan, CIEEADAC, Sector Task Force

Physical Energy Intensity

Figure 42 illustrates that, including biomass energy, the pulp and paper sector improved its physical energy intensity by 8.1 per cent over the period 1990 to 1995. This means that it took 8.1 per cent less energy to produce a tonne of pulp and paper in 1995 than it did in 1990.

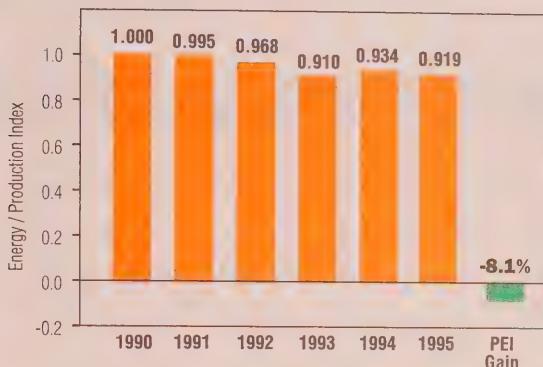
Figure 43 shows the corresponding comparison when biomass energy is excluded.

From 1990 to 1995, energy consumption, excluding biomass, increased by 1.3 per cent, while production increased by 23 per cent. As a result, when biomass energy is excluded, it took 18 per cent less energy to produce a tonne of pulp and paper in 1995 than it did in 1990. See Figure 44.

FIGURE

42

Pulp and Paper (With Biomass) Energy / Production Index and Physical Energy Intensity



FIGURE

43

Pulp and Paper Energy / Production Index (Without Biomass Energy)

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 Change
Total Energy Use (Terajoules)	380,582	368,085	362,416	361,409	396,847	385,392	1.3%
Production (1000s tonnes)	25,619	25,842	26,749	28,370	31,004	31,596	23.3%
Energy / Production (TJ/tonnes)	14.855	14.244	13.549	12.739	12.800	12.197	
Energy / Production Index	1	0.959	0.912	0.858	0.862	0.821	

Source: StatsCan, NRCan, CIEEDAC, Pulp and Paper Sector Task Force

FIGURE

44

Pulp and Paper (Without Biomass) Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 45 shows the different amounts and forms of energy used by Canada's pulp and paper sector between 1990 and 1995.

FIGURE

45

Energy Consumption by Type of Energy: 1990 to 1995									
Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Pulping Liquor	269,112	282,943	283,270	277,939	320,694	334,953	24.5%	36.0%	39.5%
Electricity	137,494	145,268	152,283	147,181	179,084	189,305	37.7%	18.4%	22.3%
Natural Gas	119,968	125,047	135,515	141,845	137,056	129,294	7.8%	16.0%	15.2%
Wood Waste	98,802	99,922	111,070	115,148	128,929	128,166	29.7%	13.2%	15.1%
Heavy Fuel Oil	115,263	89,637	67,823	65,807	69,226	53,133	-53.9%	15.4%	6.3%
Steam	1,442	1,546	1,394	1,087	4,528	7,542	423.0%	0.2%	0.9%
Middle Distillates	1,201	1,121	975	917	1,868	3,054	153.5%	0.2%	0.4%
Coal	4,093	4,286	2,192	1,928	3,647	1,231	-69.9%	0.5%	0.1%
Liquid Petroleum Gases	1,119	1,179	2,231	2,642	1,435	1,829	63.4%	0.1%	0.2%
Total Energy	748,496	750,950	756,756	754,496	846,471	848,512	13.4%		

Biomass energy (pulp liquor, waste wood, etc.) constituted 54.6 per cent of the energy consumed in 1995.

The pulp and paper industry used 25.9 per cent more biomass in 1995 than it did in 1990.

Electrical energy, mostly derived from hydraulic sources, comprised 22.3 per cent of the sector's total energy requirements. Only 23.1 per cent of the sector's energy use is based on fossil fuel.

Industrial Energy Innovators, VCR Registration and Action Plans

Twenty four pulp and paper companies, representing 66 per cent of the sector's total production and 69 per cent of the total energy consumption, have signed on with the Industrial Energy Innovator initiative or have registered with the Voluntary Challenge Registry (VCR). Twenty one companies, representing 58 per cent of total production and 62 per cent of total energy consumption, have submitted action plans to the VCR.

Case Studies

Results reported in company action plans support the industry trend of a decrease in Greenhouse Gas Emissions (from fossil fuel consumption) relative to the 1990 base year. The key actions contributing to reduced emissions are:

- increased substitution of fossil fuel by biomass fuel;
- reduced energy demands through improved process and energy use efficiency; and,
- substitution of natural gas for Bunker C oil.

Corner Brook Pulp & Paper Ltd.

The mill achieved annual energy savings of \$850,000 by eliminating the need for injection of live steam to heat paper machine shower water by applying heat exchangers to recover heat from the plant's exhaust steam. Fresh water heated in the exchangers was applied to heat the paper machine shower-water, while the still hot, dirty condensate was used for chip washing.

Pulp and Paper Task Force

Norman Pridham, Donahue Inc. Chairman
Dick Bryan, Council of Forest Industries
A. J. Chmelauskas, MacMillan Bloedel Limited
Bob Eamer, Domtar Inc.
Robert Jobin, Kruger Inc.
Mike Kuriychuk, Avenir Inc.
George Weyerhaeuser, Jr. Weyerhaeuser, Canada Ltd.

Jean-Pierre Martel, CPPA
Ray Norgen, Weyerhaeuser Canada Ltd.
H. I. Simonsen, Consultant, Canadian Pulp
and Paper Association (CPPA)
Tim Whitford, Weldwood of Canada
Pierre Vezina, AIFQ

Pulp and Paper Physical Energy Intensity Commitment: 1995 - 2000

The pulp and paper sector is committed to improving its annual physical energy intensity by 1.0 per cent for the period 1995 to 2000.

Steel

SIC 2910

Industry Background

The steel sector comprises 12 corporate entities - Algoma, Co-Steel Lasco, Dofasco, Gerdau Courtice & MRM, IPSCO, Ivaco, QIT, Sammi Altas Specialty & Stainless, Sidbec Dosco (ISTAT), Slater, the Stelco Group of Companies, and Sydney Steel. These corporations represent 25 individual companies which are all members of the Canadian Steel Producers Association (CSPA).

In 1995, the Canadian steel industry produced 14.3 million tonnes of steel and shipped 13.3 million tonnes. Products range from primary products such as rails, structural shapes, bars and rods, to hot rolled strip and plate, to highly finished cold rolled sheets and coated materials.

Markets served by the steel sector are broad and varied, including automotive vehicles and parts, appliances, packaging, construction, wire and wire products, pipe and tube and the steel service centre wholesale market.

The steel sector is Canada's third largest industrial user of energy, consuming 8.6 per cent of Canada's total industrial energy in 1995.

Establishing the Baseline

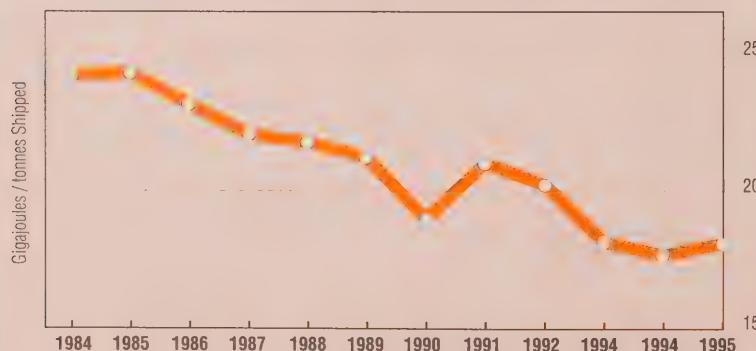
Energy use data used in this report are taken from Statistics Canada's QRES report SIC 2910. This data more closely relates to the composition of the Steel Sector Task Force and is somewhat different from SIC 2919 data which is collected by the ICE Survey and used by CIEEDAC.

Figure 46 traces the 25.4 per cent decline in Gigajoules of energy consumed per tonne of steel shipped from 1984 to 1995.

FIGURE

46

Energy Required for Each Tonne of Steel Shipped 1984 through 1995



Source: Energy: StatsCan QRES SIC 2910 Shipments: StatsCan Cat #41-001

In 1990, a four to five month labour dispute at two large steel companies caused an unusual decrease in energy consumption in that year, making 1990 a poor baseline year. To adjust for this anomaly, the Steel Task Force increased the amount of energy per tonne shipped in 1990 from 18.97 to 21.18 GJ / tonne, an increase of 10.4 per cent, as well as the shipments from 11.6 million tonnes to 12.6 million tonnes. See Figure 47.

FIGURE

47

Steel Industry's Physical Energy Intensity : 1990 to 1995

	1990	1990 Adjusted	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	207,819	219,305	236,142	246,970	241,546	236,937	241,112	9.9%
Shipments (tonnes)	11,563,101	12,602,930	11,241,164	12,207,144	13,312,911	13,406,027	13,334,662	15.3%
Energy / Shipments (GJ/tonnes)	18.97	21.18	21.01	20.23	18.14	17.67	18.08	
Energy / Shipments Index	1.00	0.992	0.955	0.857	0.834	0.854		

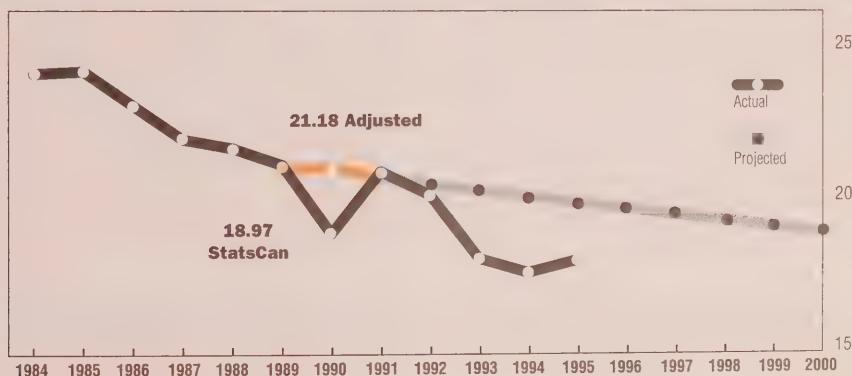
Source: StatsCan, NRCan, CIEEDAC, Steel Sector Task Force

The 1995 energy rate of 18.08 GJ / tonne shipped is an improvement of 14.6 per cent over the adjusted 1990 base year energy rate. This represents an annual improvement of 2.9 per cent. See Figure 48.

FIGURE

48

Adjusted 1990 Baseline Steel's Energy Consumption Per Tonne Shipped 1984 to 1995 Commitment and Progress



Source: Energy: StatsCan QPESD SIC 2910

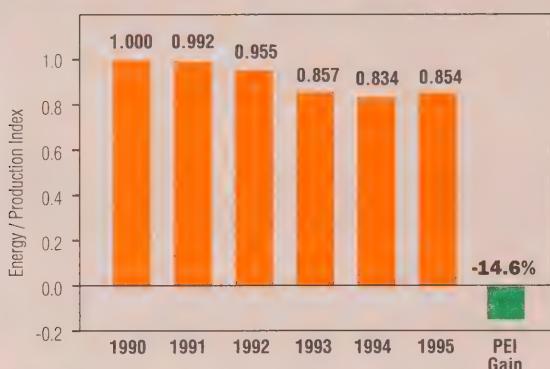
Shipments: StatsCan Cat #41-001

Steel Sector Task Force

Physical Energy Intensity

Figure 49 shows the physical energy intensity for the period 1990 to 1995 and confirms that the sector used 14.6 per cent less energy in 1995 to produce a tonne of shipped steel than it did in 1990, calculated on an adjusted 1990 base.

FIGURE

49**Steel Sector: Energy / Production Index
and Physical Energy Intensity**

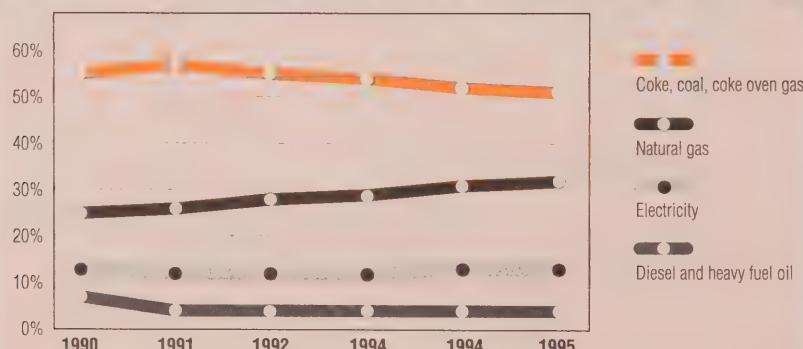
Figures 50 and 51 show the different amounts and forms of energy used by Canada's steel industry between 1990 and 1995.

FIGURE

50**Energy Consumption by Type of Energy: 1990 to 1995**

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	91 vs. 95 % Change	1991 % of Total	1995 % of Total
Coke	88,180	103,513	105,602	101,833	93,539	101,886	-1.6%	37.3%	42.3%
Natural Gas	54,713	61,610	69,323	71,809	76,527	77,940	26.5%	23.2%	32.3%
Electricity	28,537	28,841	29,866	30,402	31,253	31,179	8.1%	12.1%	12.9%
Coke Oven Gas	32,739	31,912	31,514	29,994	23,403	20,353	-36.2%	13.9%	8.4%
Heavy Fuel Oil	13,824	9,157	9,423	9,959	9,327	8,289	-9.5%	5.9%	3.4%
Diesel Oil	1,312	1,047	1,115	1,011	1,125	1,224	16.9%	0.6%	0.5%
Coal O	63	127	94	119	241	-	0.0%	0.1%	
Total Energy	219,305	236,143	246,970	245,102	235,293	241,112	9.9%		

FIGURE

51**Steel Sector: Energy Forms: 1990 through 1995**

Industrial Energy Innovators, VCR Registration and Action Plans

The sector has set a goal of having 90 per cent of its companies, representing 90 per cent of total production, registered as Industrial Energy Innovators (IEI) with action plans.

In 1995, 15 steel companies registered letters of commitment to voluntary energy efficiency improvement.

By the end of 1996, 14 of those companies had registered their IEI action plans. Another 4 companies had signed letters of commitment. This is equivalent to a total of 76 per cent of the companies in the sector and 80 per cent of the sector's production. See Figure 52.

FIGURE

52

Steel Sector's IEI Commitment and Progress



Case Studies

The following specific initiatives undertaken, implemented or planned in 1996 will make a positive contribution to the energy efficiency performance of the companies involved:

CHT Steel

Upcoming Activities

- quench water pumps will be outfitted with variable speed drives.

Dofasco

Recent Activities

- the removal of two intermediate oil storage tanks resulted in steam and electricity savings. The tanks had been steam heated and the oil had been double pumped.
- twinning and clean out of the coke oven gas line to the reheat furnaces meant the furnace could use more of the available by-product fuel and reduce consumption of purchased natural gas. Within the overall plant fuel system, flaring of coke oven gas was reduced.

Upcoming Activities

- a major yield improvement program through to the year 1999 will result in corresponding improvements in specific energy consumption. Operation practices changes in the hot mill, tin-plate processing, and galvanizing line will be initiated.

Stelco's Hilton Works

Recent Activities

- the Pulverized Coal Injection (PCI) facility was started up and was fully operational by mid-1996.
Use of PCI as an injectant to the blast furnace bypasses the coking operation, resulting in energy savings associated with producing coke and processing the coke oven gas.

Upcoming Activities

- infiltration air on coke oven batteries will be reduced, thereby saving fuel
- installation of a 10 MW steam turbine generator will use excess by-product fuel thereby reducing flaring.

Stelpipe

Recent Activities

- a natural gas fired hot water heating system at 38 per cent efficiency was replaced with induction heating at 60 per cent efficiency.
- direct drives on process water booster pumps were fitted with variable speed motors.

Sydney Steel

Recent Activities

- seven pumps are now routinely shut off during down times.
- the reheat furnace now operates using a Level 11 heating control computer model. Operators have received training.
- ladle preheat burners have been fitted with a high / low firing switching system, so that propane is saved when ladles are not being heated.

Welland Pipe

Upcoming Activities

- natural gas use on the plate dryer will be reduced by removing open flame burners and the exhaust stack, installing radiant tube burners and capturing the excess heat for reuse in the mill.

Steel Task Force

Susan Olynyk, Dofasco Inc., Chairman
Reg Belbin, Sammi-Atlas Specialty
Bill Brown, Slater HSB
Bob Downie, Gerdau Courtice
Joel Hartley, Ivaco

Ross Kent, Stelco Inc.
Joel MacLean, Sydney Steel
Geoff Saldanha, Lake Eire Steel
Hugh Sprague, Stelco Hilton Works
Tom Wesolowski, Co-Steel Lasco

Physical Energy Intensity Commitment

The steel sector is committed to improving its annual physical energy intensity by 1.0 per cent averaged over the period 1990 to 2000 based on the adjusted base year rate of 21.18 GJ / tonne shipped.

Transportation Equipment Industry

SIC 32

The transportation equipment industry (SIC 32) is made up of eight subsectors for which the quality and detail of energy and related data varies widely.

Currently, the Transportation Task Force reports on one Category 1 and one Category 2 transportation subsectors:

Category 1 Sector

- motor vehicles - SIC 3231

Category 2 Sector (See report on page 91)

- motor vehicle parts and accessories - SIC 325

Category 3 Sectors (See report on page 120)

- aircraft and aircraft parts - SIC 321
- truck and bus trailer - SIC 324
- railroad rolling stock - SIC 326
- shipbuilding and repair - SIC 327
- boat building & repair - SIC 328
- other transportation - SIC 329

The transportation equipment industry consumed 2.2 per cent of total manufacturing and mining energy in 1995. Of this amount, the motor vehicle assembly and motor vehicle parts and accessories sub sectors consumed 82 per cent (41 per cent respectively).

The aircraft, railroad rolling stock, and truck and bus sub-sectors account for most of the remaining 18 per cent of the energy used by the other six subsectors. 1994 energy use data only is available for these subsectors. See Figure 53.

FIGURE

53

Task Force	Sector	1990 Energy (PJ)	% of Total	1995 or 1994 Energy (PJ)	% of Total
Transportation	Transportation Equipment - 32	52.423	2.1%	60.2	2.2%
	Motor Vehicle Parts - 325	22.19	0.9%	24.93	0.9%
	Motor Vehicles - 3231	18.76	0.7%	24.86	0.9%
	*Aircraft & Aircraft Parts - 321	4.97	0.2%	5.28	0.2%
	*Railroad Rolling Stock - 326	2.54	0.1%	1.82	0.1%
	*Truck & Bus Trailer - 324	1.60	0.1%	1.79	0.1%
	*Shipbuilding & Repair - 327	1.55	0.1%	1.11	0.04%
	*Boatbuilding & Repair - 328	0.24	0.01%	0.45	0.02%
	*Other Transportation Equipment - 329	0.22	0.01%	0.43	0.02%
	Total	52.07	2.1%	60.67**	2.21%
	Total M / M Energy Use	2,501.96		2,749.30	

* 1994 data. Therefore the total for all subsectors is a combination of 1994 and 1995 data.

** This total is greater than the overall sector total because it is a combination of 1994 and 1995 data.

Highlights

Motor Vehicles

- This sector's physical energy intensity worsened between 1990 and 1995 so that it took 6.8 per cent more energy to produce a vehicle in 1995 than it did in 1990.

Motor Vehicle Parts

- This sector's economic energy intensity improved between 1990 and 1995 so that it took 13.3 per cent less energy in 1995 than it did in 1990 to achieve the same dollar value of production

Energy Use

In 1995, the motor vehicles industry consumed 0.9 per cent of total manufacturing and mining energy, making it the eighteenth largest industrial energy user. Figure 54 compares the energy use and motor vehicle production for the years 1990 through 1995.

Energy use was increased by 32.5 per cent, while motor vehicle production increased by 24.1 per cent between 1990 and 1995.

Energy efficiency performance in the motor vehicle assembly subsector declined in the early 1990's reflecting the overall economic downturn.

To meet increased export demand, the industry invested billions of dollars in additional capacity for paint operations, engine manufacturing and transmission plant retooling. During the construction phase, which can be up to two years, there is significant energy usage without corresponding production output. This construction activity will continue through 1999 influencing overall energy efficiency performance.

FIGURE

54

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	18,759	19,504	21,941	25,861	25,000	24,863	32.5%
Production (vehicles)	1,948,000	1,887,000	1,958,000	2,246,000	2,322,000	2,417,000	24.1%
Energy / Production (TJ/vehicles)	0.00963	0.01034	0.01121	0.01151	0.01077	0.01029	
Energy / Production Indexed	1	1.073	1.164	1.196	1.118	1.068	

Physical Energy Intensity

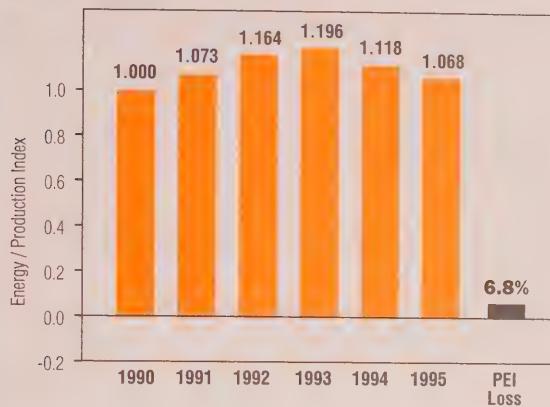
The physical energy intensity per unit of production of Canada's motor vehicle industry worsened between 1990 and 1995 by 6.8 per cent, but its energy / production performance improved 12.7 per cent between 1993 and 1995. See Figure 55.

Energy Forms

Figure 56 shows the different amounts and forms of energy used by Canada's motor vehicle industry between 1990 and 1995.

Natural gas and electricity were the predominant energy fuels, with natural gas increasing its share over the period.

FIGURE

55
**Motor Vehicles Energy / Production Index
and Physical Energy Intensity**


FIGURE

56
Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	12,523	13,293	15,633	18,434	17,960	17,353	38.6%	66.8%	69.8%
Electricity	5,059	5,181	5,527	6,647	6,189	6,421	26.9%	27.0%	25.8%
Coal	1,001	914	644	656	700	775	-22.6%	5.3%	3.1%
Liquid Petroleum Gases	79	68	62	43	59	200	153.2%	0.4%	0.8%
Heavy Fuel Oil	60	41	32	43	43	102	70.0%	0.3%	0.4%
Middle Distillates	34	6	41	35	46	9	-73.5%	0.2%	0.0%
Total Energy	18,759	19,504	21,941	25,861	25,000	24,863	32.5%		

Industrial Energy Innovator, VCR Registration and Action Plans

Currently 96 per cent of Canada's motor vehicle production has committed to become Industrial Energy Innovators, are registered with the Voluntary Challenge Registry (VCR) and have submitted action plans to the VCR.

Building on the success of its first Energy and Environment Sector Day held March 1996, the sector Task Force is planning a second Sector Day for April 1997 to be held at General Motors of Canada Corporate offices, Oshawa, Ontario.

Case Studies

The Motor Vehicles sector:

Chrysler Canada Ltd.

Project: Each plant has an energy management committee which meets on a regular basis to initiate and develop energy programs.

Savings: Between 1990 and 1995, Chrysler has reduced energy consumption per vehicle produced by 13 per cent from 12.36 MMBTU's to 10.70 MMBTU's.

Future: The target for the period 1995 to 2000 is to reduce energy consumption per vehicle produced from 10.70 MMBTU's to 9.27 MMBTU's, reflecting an overall reduction of 25 per cent between 1990 and 2000.

Ford Motor Company of Canada Limited (Essex Aluminum Plant)

Project: Installation of regenerative gas burners on two new aluminum melting furnaces plus the retrofit of one existing furnace in 1994.

Savings: Overall energy efficiency improvement of 41 per cent. The programmable logic controller (PLC) operated twin burners are cycled every twenty seconds and a graphic interface yields valuable data on furnace operation.

Future: Impressed with the efficiency improvement, Ford has contracted for two new furnaces and retrofitted four existing holding furnaces at the same location and plan one retrofit by mid-1997.

General Motors of Canada Ltd.

Project: Modifications to the controls of 78 electrically heated receiving dock slabs and ramps throughout the Oshawa Autoplex.

Savings: The estimated cost of the project is \$140,000 and will provide significant savings in reduced power costs.

Transportation Task Force

Ken Rossi, Ford Motor Co. of Canada, Chairman

Ralph Davies, Dana Canada

David Barr, Ontario Hydro

Tom Graham, General Motors of Canada

Marlene Blakeney, NRCan

Paul Hansen, Chrysler Canada Ltd.

Ian Campbell, CIPEC Secretariat

Dennis Onn, Ontario Ministry of Environment and Energy

Dave Cherney, CAMI Automotive

Yasmin Toramohamed, Canadian Vehicle Manufacturers' Association

Peter Corbyn, Automotive Parts Manufacturers' Association

Ivor da Cunha, Consumers Gas

Physical Energy Intensity Commitment: 1995 - 2000

The motor vehicle subsector is committed to improving its annual physical energy intensity by 1.0 per cent for the period 1995 to 2000.

CATEGORY 1 PHYSICAL ENERGY INTENSITY

SECTOR REPORTS

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Asbestos Mines	621	77
Peat Industry	622	78
Gypsum Mines	623	80

NOTE:

These sector reports are based on StatsCan and CIEEDAC data. Since there are, as yet, no operational Sector Task Forces in place for these sectors, there has been no industry review and validation of the data.

Chemical Fertilizers

The chemical fertilizer sector comprises two Category 1 subsectors:

- agricultural chemicals - SIC 372, and
- potash - SIC 624.

In 1995, these two subsectors used 3.3 per cent of total manufacturing and mining energy. See Figure 57. A Sector Task Force for Chemical Fertilizers will be operational in 1997.

FIGURE

57

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
Chemical Fertilizers	Agricultural Chemicals - 372	42.56	1.7%	57.66	2.1%
	Potash - 107	27.4	1.1%	31.77	1.2%
	Total	69.96	2.8%	89.43	3.3%
	Total M / M Energy Use	2,501.96		2,749.30	

Agricultural Chemicals - SIC 372

This sector produces ammonia and other nitrogenous and non-nitrogenous fertilizer, as well as herbicides, insecticides and other pesticides. It includes fertilizer mixing companies and other agricultural chemical products.

Energy Use

Agricultural chemical production consumed 2.1 per cent of Canada's industrial energy in 1995. This sector is the eleventh largest user of industrial energy.

Figure 58 below compares the total energy use and production for the years 1990 through 1995. In essence, the sector used 35 per cent more energy in 1995 than in 1990, while production increased by only 4.6 per cent. Significant volumes of natural gas are used as a feedstock and as a fuel to make ammonia, one of the basic fertilizer commodities. Data submitted by companies that produce ammonia may be in error because feedstock and energy use data may not have been kept separate. This is being studied by StatsCan and will be subject to review by the Chemical Fertilizer Task Force.

Energy consumption declined by 10 per cent from 1990 levels in 1991 and 1992. In 1993, however, it increased by nearly 30 per cent from 1992 levels, over 13 per cent from 1990 levels. This upward trend was maintained in 1994 with another 25 per cent increase, and stabilized just below that level in 1995.

FIGURE

58

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	42,556	37,133	37,182	49,377	60,294	57,655	35.5%
Production (tonnes)	5,436,473	4,632,750	5,548,209	5,205,989	5,322,165	5,686,813	4.6%
Energy / Production (TJ/tonnes)	0.008	0.008	0.007	0.009	0.011	0.010	
Energy / Production Indexed	1	1.024	0.856	1.212	1.447	1.295	

Source: Stats Can, NRCan, CIEEDAC

Physical Energy Intensity

Figure 59 illustrates the physical energy intensity of the agricultural chemical sector worsened by more than 29.5 per cent over the period 1990 to 1995. As indicated earlier, this may be due to a data collection problem and is being investigated.

FIGURE

59

Agricultural Chemicals Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 60 shows the different amounts and forms of energy used by Canada's agricultural chemical industry between 1990 and 1995.

Natural gas represented almost 94 per cent of the total energy use in 1995, up from 90 per cent in 1990.

FIGURE

60

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	38,526	33,093	33,239	44,467	55,291	54,018	40.2%	90.5%	93.7%
Electricity	3,801	3,772	3,754	4,740	4,861	3,510	-7.7%	8.9%	6.1%
Steam	93	113	76	46	35	67	-28.0%	0.2%	0.1%
Heavy Fuel Oil	77	89	46	48	42	30	-61.0%	0.2%	0.1%
Liquid Petroleum Gases	54	62	63	72	60	21	-61.1%	0.1%	0.0%
Middle Distillates	2	2	1	1	1	1	-50.0%	0.0%	0.0%
Total Energy	42,556	37,133	37,182	49,377	60,294	57,655	35.5%		

Potash - SIC 624

Energy Use

Potash production consumed 1.2 per cent of Canada's industrial energy in 1995, making it the fourteenth largest industrial energy user.

Figure 61 below compares the potash sector's total energy use and production for the years 1990 through 1995. In essence, the sector used 16 per cent more energy in 1995 than it did in 1990 but produced over 29 per cent more product.

FIGURE

61

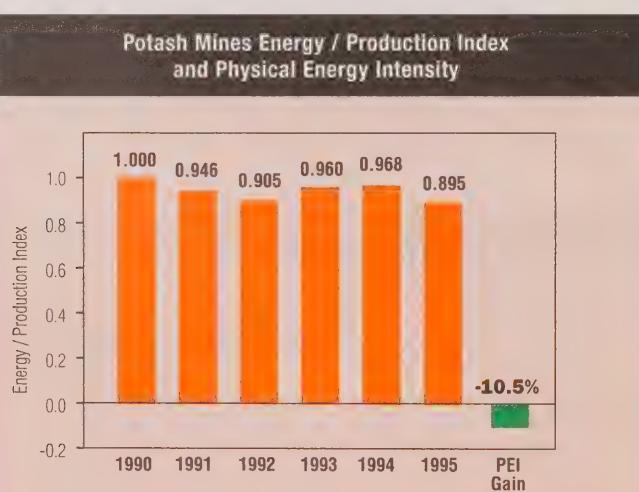
	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	27,398	27,447	25,787	25,725	31,036	31,771	16.0%
Production (tonnes)	6,989,481	7,405,575	7,269,583	6,835,865	8,181,946	9,056,604	29.6%
Energy / Production (TJ/tonne)	0.0039	0.0037	0.0035	0.0038	0.0038	0.0035	
Energy / Production Indexed	1	0.946	0.905	0.960	0.968	0.895	

Source: Stats Can, NRCan, CIEEADAC

Physical Energy Intensity

Figure 62 illustrates that the potash sector used 10.5 per cent less energy to produce a tonne of potash in 1995 than in 1990.

FIGURE

62

Energy Forms

Figure 63 shows the different amounts and forms of energy used by Canada's potash sector between 1990 and 1995.

Natural gas was by far the most important energy form used by the potash sector in 1995, representing over 75 per cent of the total energy used, followed by electricity at 19 per cent.

FIGURE

63**Energy Consumption by Type of Energy: 1990 to 1995**

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	19,746	20,566	18,930	19,043	23,607	23,923	21.2%	72.1%	75.3%
Electricity	6,090	5,134	5,118	5,063	5,733	6,040	-0.8%	22.2%	19.0%
Middle Distillates	1,465	1,653	1,633	1,520	1,585	1,711	16.8%	5.3%	5.4%
Liquid Petroleum Gases	97	92	105	98	109	96	-1.0%	0.4%	0.3%
Total Energy	27,398	27,447	25,787	25,725	31,036	31,771	16.0%		

Industrial Energy Innovators, VCR Registration and Action Plans

Six of Canada's potash companies have committed to become Industrial Energy Innovators and five have registered with the Voluntary Challenge Registry (VCR) and have submitted action plans to the VCR.

Case Studies**Potash Corporation of Saskatchewan Inc., Rocanville Division**

For 1996, the Rocanville Division's electrical energy reduction goal was set at 0.74 per cent of the 1995 usage in kWh / tonne of product. The type of energy efficiency projects include:

- metering and tracking energy costs;
- investment in new technology; and,
- replacement of inefficiency equipment.

The mine has appointed an energy efficiency champion.

Projects:**Megatex Screen:**

Ten pieces of equipment in the reclaim circuit of the mill were replaced with one Megatex screen. This initiative improves rail car loading by a minimum of 15 per cent and reduces by 195 HP the amount of power required. The estimated annual energy savings / tonne of product are 0.74 kW / tonne.

Scalping Screen Replacement:

A mechanically operated scalping screen was replaced with a grizzly, where the raw ore is sized by falling over a grating. The over-sized ore is sent to a crusher. This process reduces maintenance costs, eliminates the need for screen cloths and for a 30 HP motor. The estimated annual energy savings / tonne of product are 0.10 kW / tonne.

Power Monitoring:

Power monitoring equipment permits monitoring of energy use in individual plant areas, for example, underground, refinery circuits I & II and the tailings area.

Chemical Products

SIC 37

The chemical products category includes a number of major energy consuming sub-sectors. The three dealt with in this report are:

Category 1 Sectors

- industrial inorganic chemicals - SIC 3711, and
- plastic and synthetic resins - SIC 3731.

Category 3 Sector

- industrial organic chemicals - SIC 3712. (See report on page 125)

Industrial organic and inorganic chemicals account for nearly two-thirds of the energy consumed by SIC 37. In total, organic, inorganic and plastic and resins accounted for 7.4 per cent of total manufacturing and mining energy use in 1995. See Figure 64.

FIGURE

64

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
Chemical Products	Chemical Products - 37	273.90	10.9%	274.24	10.0%
	Organic Chemicals - 3712	128.15	5.1%	102.62	3.7%
	Inorganic Chemicals - 3711	71.42	2.9%	73.23	2.7%
	Plastic & Resins - 3731	17.37	0.7%	28.30	1.0%
	Total	216.94	8.7%	204.15	7.4%
	Total M / M Energy Use	2,501.96		2,749.30	

Over the coming year, the Canadian Chemical Producers Association (CCPA) will continue to work with Statistics Canada, CIEEDAC and Environment Canada to reconcile the data collected on the chemical products sectors with the industry's own data.

Inorganic Chemicals - SIC 3711

Energy Use

Inorganic chemical production consumed 2.7 per cent of Canada's industrial energy in 1995, making it the eighth largest industrial energy user.

Figure 65 below compares the total energy use and production of the inorganic chemical sector for the years 1990 through 1995. In essence, the sector used 2.5 per cent more energy in 1995 than it did in 1990 but produced 3.8 per cent more product.

FIGURE

65

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	71,416	70,689	69,268	66,044	59,501	73,232	2.5%
Production (tonnes)	8,696,825	8,002,678	8,204,731	8,345,817	8,640,437	9,028,076	3.8%
Energy / Production (TJ/tonnes)	0.008	0.009	0.008	0.008	0.007	0.008	
Energy / Production Indexed	1	1.076	1.028	0.964	0.839	0.988	

Source: StatsCan, NRCan, CIEEDAC

Energy use data shown in this report for the chemical sector are based on Statistics Canada's ICE Survey. The Canadian Chemical Producers' Association (CCPA) annual Reducing Emissions report covers emissions for all greenhouse gases for all of its members. The CCPA methodology does not correspond directly with the energy use data reported by StatsCan and efforts are underway to reconcile the differences.

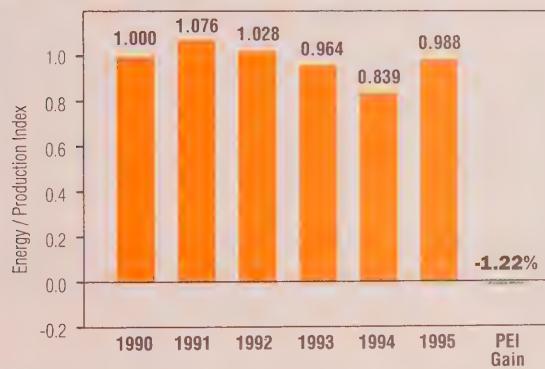
Physical Energy Intensity

Figure 66 illustrates that the inorganic chemical sector improved its physical energy intensity by 1.2 per cent over the period 1990 to 1995.

FIGURE

66

Inorganic Chemical Energy / Production Index and Physical Energy Intensity



Energy Forms

Figures 67 shows the different amounts and forms of energy used by Canada's inorganic chemical sector between 1990 and 1995

Electricity and natural gas were by far the most important energy forms used by this sector in 1995, representing together over 90 per cent of total energy use.

FIGURE
67

Energy Consumption by Type of Energy: 1990 to 1995									
Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Electricity	39,631	39,088	42,665	38,420	37,049	44,099	11.3%	55.5%	60.2%
Natural Gas	24,415	23,216	20,860	23,509	16,437	22,034	-9.8%	34.2%	30.1%
Steam	5,720	6,914	4,662	2,839	2,142	4,551	-20.4%	8.0%	6.2%
Heavy Fuel Oil	1,239	1,253	881	1,075	3,668	1,105	-10.8%	1.7%	1.5%
Liquid Petroleum Gases	79	75	95	84	61	405	412.7%	0.1%	0.6%
Middle Distillates	328	140	100	110	141	333	1.5%	0.5%	0.5%
Total Energy	71,416	70,689	69,268	66,044	59,501	73,232	2.5%		

Plastic and Synthetic Resins - SIC 3731

Energy Use

Plastic and synthetic resin production consumed 1.0 per cent of Canada's industrial energy in 1995, making it the fifteenth largest industrial energy user.

Figure 68 below compares the total energy use and production for the years 1990 through 1995. In essence, the sector used 63 per cent more energy in 1995 than it did in 1990 but produced only 30 per cent more product.

Energy consumption in 1993 and 1995 was considerably higher than in any other year in the five year period. A review of the industry's submissions to StatsCan is underway to determine whether certain companies moved from one SIC classification to another because of shifts in their production.

FIGURE

68

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	17,374	15,804	14,229	26,539	16,043	28,295	62.9%
Production (tonnes)	1,782,437	1,799,207	1,936,965	1,989,931	2,144,298	2,320,545	30.2%
Energy / Production (TJ/tonne)	0.010	0.009	0.007	0.013	0.007	0.012	
Energy / Production Indexed	1	0.901	0.754	1.368	0.768	1.251	

Source: StatsCan, NRCan, CIEEADAC

Energy use data shown in this report for the chemical sector are based on Statistics Canada's ICE Survey. The Canadian Chemical Producers' Association (CCPA) annual Reducing Emissions report covers emissions for all greenhouse gases for all of its members. The CCPA methodology does not correspond directly with the energy use data reported by StatsCan and efforts are underway to reconcile the differences.

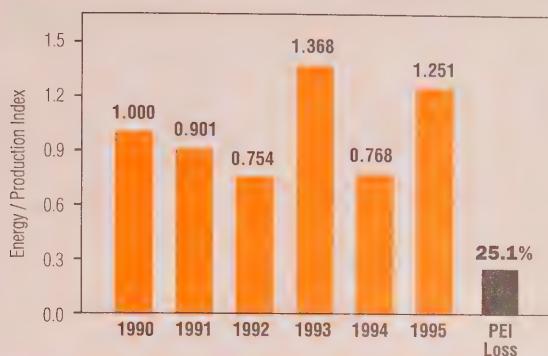
Physical Energy Intensity

Figure 69 illustrates that the physical energy intensity of the plastic and synthetic resins sector worsened by 25 cent over the period 1990 to 1995.

FIGURE

69

Plastic and Synthetic Resins Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 70 shows the different amounts and forms of energy used by Canada's plastic and synthetic resins sector between 1990 and 1995.

Specifically, natural gas, electricity and steam represented, together, over 99 per cent of the total energy used. Steam became a major energy form in 1995 capturing over 25 per cent of the total, primarily replacing natural gas, heavy fuel oil, middle distillates and liquid petroleum gases.

FIGURE

70

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	11,086	9,714	9,644	19,635	8,790	12,065	8.8%	63.8%	42.6%
Electricity	4,125	4,301	4,327	6,079	6,961	8,894	115.6%	23.7%	31.4%
Steam	0	0	0	0	0	7,198		0.0%	25.4%
Heavy Fuel Oil	2,115	1,737	212	777	223	137	-93.5%	12.2%	0.5%
Middle Distillates	20	7	13	18	32	0	-100.0%	0.1%	0.0%
Liquid Petroleum Gases	27	43	31	27	36	0	-100.0%	0.2%	0.0%
Total Energy	17,374	15,804	14,229	26,539	16,043	28,295	62.9%		

SIC 10

Food Industry

The food industry, SIC 10, consumed 3.4 per cent of total manufacturing and mining energy.

Three Food Sector Task Forces - Food Processing, Dairy and General Manufacturing - are responsible for seven food subsectors. See Figure 71.

The Food Processing and Dairy Task Forces will be operational in 1997.

Category 1 Sector

- meat and poultry - SIC 101

Category 2 Sectors (See report on page 96)

- fruit and vegetables - SIC 103,
- bakery products - SIC 107

Category 3 Sectors (See report on page 107)

- dairy products - SIC 104
- other food products - SIC 109
- vegetable oil mills - SIC 106
- fish & fish products - SIC 101

FIGURE

71

	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
Task Forces	Food Industry - 10	85.61	3.4%	85.74	3.4%
1 Food Processing	Meat & Poultry - 101	15.43	0.6%	10.68*	0.4%
	Fruits / Vegetables - 103	9.45	0.4%	8.12*	0.3%
	Bakery Products - 107	5.70	0.2%	6.52*	0.2%
	Subtotal	30.59	0.01	25.32*	0.01
2 Dairy	Dairy Products - 104 (1)	11.95	0.5%	12.94	0.5%
3 Gen. Manufacturing	Other Food Products - 109	19.02	0.8%	20.70	0.8%
	Vegetable Oil Mills - 106	5.15	0.2%	6.91	0.3%
	Fish & Fish Products - 101	3.32	0.1%	3.92	0.1%
	Subtotal	27.49	1.1%	31.53	1.1%
	Total	70.03**	2.8%	69.79**	2.5%
	Total M / M Energy Use	2,501.96		2,749.30	

* latest data is for 1994

** Note the food subsectors listed above represent all the subsectors for which energy use data is available at this time.
They do not add up to the total for Food Industry SIC 10.

Highlights

Three of Canada's largest food processors, Kraft Canada Ltd., Maple Leaf Foods and McCain Foods, have signed Letters of Cooperation with CIPEC. These corporations have companies and divisions operating large processing plants in the meat and poultry, fruit and vegetables, bakery and dairy sectors. As well, the Ontario Food Processors Association has signed a Letter of Cooperation with CIPEC.

The Canadian Meat Council, the Food and Consumer Products Manufacturers of Canada and the Canadian Soft Drink Association are supporting CIPEC by acquainting their members about CIPEC and energy savings opportunities.

Meat & Poultry

- This subsector used 38 per cent less energy in 1995 to produce a tonne of product than it did in 1990.

Fruit & Vegetables

- This subsector improved its economic energy intensity by over 20 per cent between 1990 and 1995.

Bakery Products

- This subsector's economic energy intensity deteriorated by 9.6 per cent between 1990 and 1995.

Meat & Poultry - SIC 101

Energy Use

Meat and poultry production consumed 0.4 per cent of Canada's industrial energy in 1995, making it the twenty-seventh largest industrial energy user.

Figure 72 below compares the meat and poultry sector's total energy use and production for the years 1990 through 1995. In essence, the sector used over 30 per cent less energy in 1995 than it did in 1990 but produced 12 per cent more product.

In fact, the energy consumed in 1995 was 40 per cent less than that consumed in 1994, while production actually increased. This could indicate that there may be some reporting inconsistencies between ASM and ICE, or that the ASM data may be in error. The data are being investigated.

FIGURE

72

	1990	1991	1992	1993	1994	1995	1990 vs. 1995
Total Energy Use (Terajoules)	15,433	15,525	13,290	14,632	17,955	10,678	-30.8%
Production (tonnes)	2,708,344	2,673,618	2,796,725	2,784,157	2,947,480	3,029,562	11.9%
Energy / Production (TJ/tonne)	0.006	0.006	0.005	0.005	0.006	0.004	
Energy / Production Indexed	1	1.019	0.834	0.922	1.069	0.619	

Physical Energy Intensity

Notwithstanding the potential problems with the data, Figure 73 illustrates that the meat and poultry sector improved its physical energy intensity by 38 per cent over the period 1990 to 1995.

**FIGURE
73**

Meat and Poultry Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 74 shows the different amounts and forms of energy used by Canada's meat & poultry sector between 1990 and 1995.

**FIGURE
74**

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	10,100	9,881	8,174	9,491	12,058	6,088	-39.7%	65.4%	57.0%
Electricity	4,090	4,169	4,044	4,266	4,453	3,619	-11.5%	26.5%	33.9%
Middle Distillates	355	288	258	274	282	450	26.8%	2.3%	4.2%
Liquid Petroleum Gases	305	288	261	328	456	35	-88.5%	2.0%	0.3%
Total Energy	15,433	15,525	13,290	14,632	17,955	10,678	-30.8%		

Industrial Energy Innovators, VCR Registration and Action Plans

Five of Canada's largest meat & poultry companies have committed to become Industrial Energy Innovators and four have registered with the Voluntary Challenge Registry (VCR) and have submitted action plans to the VCR.

Non-Metal Mining

SIC 62

Total energy use in the non-metal mining sector in 1995 amounted to 43.75 petajoules. This sector comprises five subsectors as illustrated in Figure 75.

FIGURE

75

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
Non Metal Mining	Non Metal Mining - 62*	40.14	0.02	43.75	1.6%
	Other Non-Metal Mines - 629	6.59	0.3%	10.69	0.4%
	Peat Industry - 622	0.66	0.0%	0.79	0.0%
	Gypsum - 623	0.58	0.0%	0.50	0.0%
	Asbestos - 621	4.91	0.2%	0.00	0.0%
	Total	40.14	1.6%	43.75	1.6%
	Total M / M Energy Use	2,501.96		2,749.30	

*Potash, which for StatsCan purposes is part of Non Metal Mining, is reported on in the Chemical Fertilizer section.

Category 1 sectors

- asbestos mines - SIC 621
- peat industry - SIC 622
- gypsum mines - SIC 623

Category 3 sector

- other non-metal mines - SIC 629 (See report on page 130)

Asbestos Mines - SIC 621

Energy Use

1994 data is the latest available for the asbestos mines sector. In 1995, data from this sector was transferred to SIC 629 - other non-metal mines.

The asbestos mining sector used 26 per cent less energy in 1994 than it did in 1990 but produced 27.7 per cent less product. Figure 76 below compares the total energy use and production of the asbestos mines sector for the years 1990 through 1994.

FIGURE

76

	1990	1991	1992	1993	1994	90 vs. 94 % Change
Total Energy Use (Terajoules)	4,914	4,792	3,997	3,912	3,633	-26.1%
Production (tonnes)	724,620	639,009	590,641	516,618	523,545	-27.7%
Energy / Production (TJ/tonne)	0.007	0.007	0.007	0.008	0.007	
Energy / Production Indexed	1	1.106	0.998	1.117	1.023	

Physical Energy Intensity

Figure 77 illustrates that the physical energy intensity of the asbestos industry deteriorated by 2.3 per cent over the period 1990 to 1994.

FIGURE

77

Asbestos Mines Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 78 shows the different amounts and types of energy used by Canada's asbestos sector between 1990 and 1994.

FIGURE

78

Energy Consumption by Type of Energy: 1990 to 1994

	1990	1991	1992	1993	1994	90 vs. 94	1990 % of Total	1994 % of Total
Heavy Fuel Oil	1823	1973	1364	1491	1288	-29.3%	37.1%	35.5%
Electricity	1,407	1,251	1,372	1,264	1,250	-11.2%	28.6%	34.4%
Middle Distillate	1,612	1,516	1,193	1,085	1,052	-34.7%	32.8%	29.0%
Liquid Petroleum Gases	71	51	65	70	41	-42.3%	1.4%	1.1%
Total Energy	4,913	4,791	3,994	3,910	3,631	-26.1%		

Peat Industry - SIC 622

Energy Use

Peat production consumed 0.79 per cent of Canada's manufacturing and mining energy in 1995.

The sector used 20.4 per cent more energy in 1995 than it did in 1990 but produced 69.2 per cent more product. Figure 79 below compares the total energy use and production for the years 1990 through 1995.

FIGURE

79

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	656	794	501	545	682	790	20.4%
Production (tonnes)	679,224	791,234	704,128	770,708	937,868	1,149,477	69.2
Energy / Production (TJ/tonne)	0.001	0.001	0.001	0.001	0.001	0.001	
Energy / Production Indexed	1	1.039	0.737	0.732	0.753	0.712	

Physical Energy Intensity

Figure 80 illustrates that the peat sector improved its physical energy intensity and used 29 per cent less energy to produce a tonne of peat in 1995 than it used in 1990.

FIGURE

80

Peat Industry Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 81 shows the different amounts and forms of energy used by Canada's peat sector between 1990 and 1995.

FIGURE

81

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Middle Distillates	176	216	182	219	278	297	68.8%	26.8%	37.6%
Electricity	104	125	121	135	151	178	71.2%	15.9%	22.5%
Liquid Petroleum Gases	66	67	88	83	100	146	121.2%	10.1%	18.5%
Natural Gas	304	380	99	100	140	140	-53.9%	46.3%	17.7%
Heavy Fuel Oil	4	4	8	7	12	28	600.0%	0.6%	3.5%
Total Energy	656	794	501	545	682	790	20.4%		

Gypsum Mines - SIC 623

Energy Use

Gypsum production consumed 0.5 per cent of Canada's industrial energy in 1995. Figure 82 below compares the total energy use and production of gypsum mines for the years 1990 through 1995. In essence, the sector used 14.8 per cent less energy in 1995 than it did in 1990 but produced 1.6 per cent less product.

FIGURE

82

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	582	488	537	570	545	496	-14.8%
Production (tonnes)	8,532,096	6,696,606	7,278,610	7,706,009	8,948,528	8,392,394	-1.6%
Energy / Production (TJ/tonne)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Energy / Production Indexed	1	1.068	1.082	1.084	0.893	0.866	

Physical Energy Intensity

Figure 83 illustrates that gypsum mines improved their physical energy intensity so that they required 13 per cent less energy to produce a tonne of gypsum in 1995 than they used in 1990.

FIGURE
83

Gypsum Mines Energy / Production Index and Physical Energy Intensity



Energy Forms

Figure 84 shows the different amounts and forms of energy used by Canada's gypsum sector between 1990 and 1995. Middle distillates and electricity represented, together, 98 per cent of the total energy used in 1995.

FIGURE
84

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Middle Distillate	378	304	336	371	325	333	-11.9%	64.9%	67.1%
Electricity	199	180	195	194	209	154	-22.6%	34.2%	31.0%
Liquid Petroleum Gases	4	4	4	3	10	7	75.0%	0.7%	1.4%
Total Energy	582	488	537	570	545	496	-14.8%		

Category 2

Sectors and Task Forces

Economic Energy Intensity (EEI)

(EEI = Energy used by stationary industrial sources of a sector divided by the GDP of that sector measured in 1986 dollars)



Category 2 Sectors

There are eight sectors for which energy use and GDP data are collected by StatsCan. As a result, an economic energy intensity (EEI) can be calculated for each of these sectors.

Since no physical units of production are available, physical energy intensity (PEI) cannot be calculated.

In 1995, these eight sectors used 3.4 per cent of total manufacturing and mining energy consumption, down slightly from 1990. See Figure 85.

FIGURE

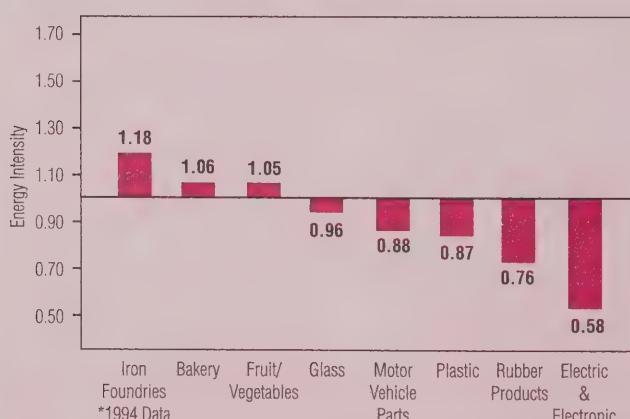
85

# Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total	90 vs. 95 EEI
1 Motor Vehicles Parts / Asses. - 325	22.2	0.9%	24.9	0.9%	0.88
2 Electrical and Electronic - 33	18.3	0.7%	17.5	0.6%	0.58
3 Glass & Glass Products - 356	14.2	0.6%	13.9	0.5%	0.96
4 Plastics Products - 16	12.0	0.5%	13.3	0.5%	0.95
5 Rubber Products - 15	9.1	0.4%	10.4	0.4%	0.76
6 Fruit / Vegetables - 103	9.5	0.4%	8.1	0.3%	1.05
7 Iron Foundries - 294	7.2	0.3%	N/A *	-	-
8 Bakery Products - 107	5.7	0.2%	6.5	0.2%	1.06
Subtotal	98.23	3.9%	94.61	3.4%	
Remaining Sectors	2,403.73	96.1%	2,654.69	96.6%	
Total M / M	2,501.96	100%	2,749.30	100%	

* 1994 is the latest data available for the Iron Foundries sector.

Three of the eight Category 2 sectors - Iron Foundries, Fruit & Vegetables, and Bakery Products - experienced a worsening of their economic energy intensity over the period 1990 to 1995. See Figure 86.

FIGURE

86
**Energy Intensity of 8 Sectors of Manufacturing and Mining:
1990 through 1995**


Category 2 Sectors With Task Forces Operational in 1996

Three Category 2 sectors, representing 2.0 per cent of total manufacturing and mining energy use in 1995, have Sector Task Forces now in place. See Figure 87.

FIGURE

87

Category 2 Sector Task Forces Operational in 1996

Category 2 Sector Task Forces / SIC	1990 Energy (PJ)	Energy as % of Total	1995 Energy (PJ)	Energy as % of Total	90 vs. 95 EEI
1 Electrical and Electronic - 33	18.3	0.7%	17.5	0.6%	0.580
2 General Manufacturing					
Glass and Glass Products - 356	14.2	0.6%	13.9	0.5%	0.959
3 Transportation					
Motor Vehicle Parts - 325	22.2	0.9%	24.9	0.9%	0.880
Subtotal	54.7	2.2%	56.3	2.0%	
Total M/M	2,501.96		2,749.30		

Category 2 Sectors With Sector Task Forces Operational in 1997

Four other Sector Task Forces will be operational in 1997, involving five Category 2 sectors and 1.4 per cent of total manufacturing and mining energy use in 1995. See Figure 88.

FIGURE

88

Category 2 Sector Task Forces Operational in 1997

Category 2 Sector Task Forces / SIC	1990 Energy (PJ)	Energy as % of Total	1995 Energy (PJ)	Energy as % of Total	90 vs. 95 EEI
1 Food Processing					
Fruit / Vegetables - 103	9.4	0.4%	8.1	0.3%	1.052
Bakery Products - 107	5.7	0.2%	6.5	0.2%	1.061
2 Foundries					
Iron Foundries - 294	7.2	0.3%	N/A	-	-
3 Plastics Products - 16	12.0	0.5%	13.3	0.5%	0.870
4 Rubber Products - 15	9.1	0.4%	10.4	0.4%	0.759
Subtotal	43.53	1.7%	38.32	1.4%	
Total M/M	2,501.96		2,749.30		

CATEGORY 2
ECONOMIC ENERGY INTENSITY

SECTOR TASK FORCE REPORTS

	SIC	Page
● Electrical and Electronic	33	86
● General Manufacturing Glass & Glass Products	356	89
● Transportation Equipment Industry Motor Vehicles Parts and Accessories	32 325	94 92

Electrical and Electronic

SIC 33

Industry Background

The electrical and electronic sector employs about 130,000 people.

Energy Use

Figure 89 compares the energy use and electrical and electronic GDP for the years 1990 through 1995.

FIGURE

89

	1990	1991	1992	1993	1994	1995	% Change
Total Energy Use (Terajoules)	18,326	15,555	18,035	16,852	17,242	17,472	-4.7%
GDP (mil '86 \$)	8,192	8,003	8,506	8,766	10,793	12,955	58.1%
Energy / GDP (TJ/\$)	2.24	1.94	2.12	1.92	1.57	1.30	
Energy / GDP Indexed	1	0.87	0.95	0.86	0.70	0.58	

Economic Energy Intensity

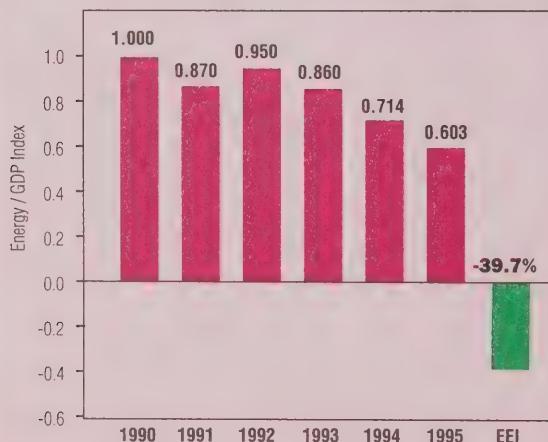
Energy use was reduced by 4.7 per cent, while sector GDP increased by 58 per cent between 1990 and 1995. This resulted in Canada's electrical and electronic industry improving its economic energy intensity between 1990 and

FIGURE

90

Electrical and Electronic Energy / GDP Index and Economic Energy Intensity

1995 by 39.7 per cent. In other words, it took 39.7 per cent less energy to produce \$1 of sector GDP in 1995 than it did in 1990. See Figure 90.



Energy Forms

Figures 91 shows the different amounts and types of energy used by Canada's electrical and electronic sector between 1990 and 1995.

Specifically, electricity became the principal energy form consumed, replacing natural gas. Heavy fuel oil has been totally replaced by other energy forms.

FIGURE

91

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Electricity	7,658	7,034	9,503	7,837	7,923	9,431	23.2%	38.4%	54.0%
Natural Gas	9,979	8,046	8,094	8,563	8,800	7,836	-21.5%	43.9%	44.8%
Liquid Petroleum Gases	250	228	265	247	268	181	-27.6%	1.2%	1.0%
Middle Distillates	158	100	84	57	97	23	-85.4%	0.5%	0.1%
Heavy Fuel Oil	250	140	86	120	146	0	-100.0%	0.8%	0.0%
Total Energy	18,326	15,555	18,035	16,852	17,242	17,472	-4.7%		

Industrial Energy Innovators, VCR Registration and Action Plans

Seven electrical and electronic companies have committed to become Industrial Energy Innovators, of which three have registered with the Voluntary Challenge Registry (VCR) and have submitted action plans.

Case Studies

Ascolelectric Limited

Project: the company established an energy efficiency team that installed high efficiency lighting in the office and plant.
Savings: electrical savings of 23 per cent have been recorded when 1993 consumption is compared with 1996 consumption.
Future: the company intends to install water recycling equipment in its manufacturing process with expected savings of 25 per cent.

Broan Limited

Project: the company undertook to reduce electrical consumption in its HVAC, air compressors, water heaters, baseboard and wall heaters.
Savings: electrical saving of 36.6 per cent have been recorded over a 7 month period.
Future: the company intends to reduce energy consumption on process equipment by at least 15 per cent.

Honeywell Limited

Project: the company moved its manufacturing operations into new facilities with "state of the art" energy management control systems.
Savings: Honeywell's goal is to reduce its energy use by 15 per cent by 2000.

Northern Telecom Belleville site

Project: the company undertook a lighting retrofit program.
Savings: electricity savings of 17 per cent or \$77,000 a year.

Ottawa Site

Project: the company replaced an inefficient CFC chiller with a high efficiency CFC chiller.

Savings: \$186,00 a year with an internal rate of return of 53 per cent.

Future: a global energy "savings opportunity" is estimated to result in savings of \$19.6 million in the 1996 to 2000 period.

Electrical and Electronic Task Force

Steve Horvath, Honeywell Ltd., Chairman

Ray Patterson, Northern Telecom

Douglas Fleming, Reliance

Howard Kunkel, Ascolectric

Paul Milbury, IBM

Richard McCollin, Ford Electronics

Physical Energy Intensity Commitment: 1996 - 2000

The electrical and electronic sector is committed to improving its economic energy intensity by 1.25 per cent per year for the period 1996 to 2000.

General Manufacturing

The General Manufacturing Task Force is responsible for 8.5 per cent of total manufacturing and mining energy use. See Figure 92.

FIGURE

92

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
General Manufacturing	Glass & Glass Products - 356	14.2	0.6%	13.9	0.5%
	Category 3 (31 sectors)	197.4	7.9%	216.3	7.9%
	Total General Manufacturing	211.6	8.5%	230.2	8.5%

Category 2 Sector

- glass and glass products - SIC 356

Category 3 Sectors (See report on page 112)

- 31 sectors

Only energy use data is available for the Category 3 sectors. These sectors usually involve small to medium sized companies which:

- do not consume a large amount of energy and energy use is not a significant cost of doing business;
- are relatively small companies which do not usually have the resources to participate in a Sector Task Force.

1995 data is available for only eight of the Category 3 sectors, representing 3.0 per cent of total manufacturing and mining energy use.

For the remaining 23 sectors, the latest energy use data is for 1994. In total, they amount to another 6.2 per cent of the total manufacturing and mining energy use.

Glass and Glass Products - SIC 356

Energy Use

In 1995, the glass and glass products industry consumed 0.5 per cent of total manufacturing and mining energy. Figure 93 compares the energy use and glass and glass products GDP for the years 1990 through 1995.

Energy use decreased by 1.9 per cent, while the sector's GDP increased by 7.5 per cent between 1990 and 1995.

FIGURE

93

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	14,187	12,966	15,638	15,795	17,710	13,916	-1.9%
GDP Output (mil 86\$)	572	513	550	603	631	615	7.5%
Energy / GDP	24.802	25.275	28.433	26.194	28.067	22.628	
Energy / GDP Indexed	1	1.019	1.146	1.056	1.132	0.912	

Glass and Glass Products - SIC 356

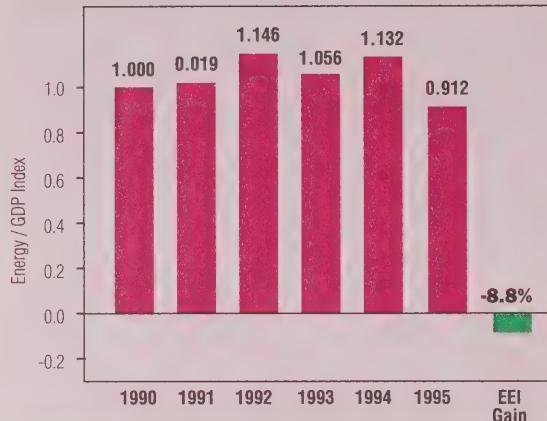
Economic Energy Intensity

The sector's economic energy intensity improved by 8.8 per cent between 1990 and 1995. See Figure 94.

FIGURE

94

Glass and Glass Products Energy / GDP Index and Economic Energy Intensity



Energy Forms

Figure 95 shows the different amounts and forms of energy used by Canada's glass and glass products companies between 1990 and 1995.

Natural gas was the predominant energy fuel, increasing its share of sector energy use over electricity during the five year period.

FIGURE

95

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	14,187	12,966	15,638	15,795	17,710	13,916	-1.9%
GDP Output (mil 86\$)	572	513	550	603	631	615	7.5%
Energy / GDP	24.802	25.275	28.433	26.194	28.067	22.628	
Energy / GDP Indexed	1	1.019	1.146	1.056	1.132	0.912	

Economic Energy Intensity Commitment: 1995 - 2000

The general manufacturing sector, of which the glass and glass products subsector is part, is committed to improving its economic energy intensity by 1.0 per cent per year for the period 1995 to 2000.

Transportation Equipment Industry

SIC 32

The transportation equipment industry (SIC 32) is made up of eight subsectors for which the quality and detail of energy and related data varies widely.

Currently, the Transportation Task Force reports on one Category 1 and one Category 2 transportation subsectors:

Category 1 Sector

- motor vehicles - SIC 3231 (See report on page 61)

Category 2 Sector

- motor vehicle parts and accessories - SIC 325

Category 3 Sectors (See report on page 120)

- aircraft and aircraft parts - SIC 321
- truck and bus trailer - SIC 324
- railroad rolling stock - SIC 326
- shipbuilding and repair - SIC 327
- boat building & repair - SIC 328
- other transportation - SIC 329

The transportation equipment industry consumed 2.2 per cent of total manufacturing and mining energy in 1995. Of this amount, the motor vehicle assembly and motor vehicle parts and accessories sub sectors consumed 82 per cent (41 per cent respectively).

The aircraft, railroad rolling stock, and truck and bus sub-sectors account for most of the remaining 18 per cent of the energy used by the other six subsectors. 1994 energy use data only is available for these subsectors. See Figure 96.

FIGURE

96

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 OR 1994 Energy (PJ)	% of Total
Transportation	Transportation Equipment - 32	52.423	2.1%	60.2	2.2%
	Motor Vehicle Parts - 325	22.19	0.9%	24.93	0.9%
	Motor Vehicles - 3231	18.76	0.7%	24.86	0.9%
	*Aircraft & Aircraft Parts - 321	4.97	0.2%	5.28	0.2%
	*Railroad Rolling Stock - 326	2.54	0.1%	1.82	0.1%
	*Truck & Bus Trailer - 324	1.60	0.1%	1.79	0.1%
	*Shipbuilding & Repair - 327	1.55	0.1%	1.11	0.04%
	*Boatbuilding & Repair - 328	0.24	0.01%	0.45	0.02%
	*Other Transportation Equipment - 329	0.22	0.01%	0.43	0.02%
	Total	52.07	2.1%	60.67**	2.21%
	Total M / M Energy Use	2,501.96		2,749.30	

* 1994 data. Therefore the total for all subsectors is a combination of 1994 and 1995 data.

** This total is greater than the overall sector total because it is a combination of 1994 and 1995 data.

Highlights

Motor Vehicles

- This sector's physical energy intensity worsened between 1990 and 1995 so that it took 6.8 per cent more energy to produce a vehicle in 1995 than it did in 1990.

Motor Vehicle Parts

- This sector's economic energy intensity improved between 1990 and 1995 so that it took 13.3 per cent less energy in 1995 than it did in 1990 to achieve the same dollar value of production

Motor Vehicle Parts and Accessories - SIC 325

Industry Background

The automotive parts sector is the seventeenth largest energy using sector, accounting for 0.9 per cent of total manufacturing and mining energy use. Over the past few years, the sector has gone through restructuring, resulting in fewer but larger companies. The sector exports over 85 per cent of its production to the U.S., Mexico, Europe and Asia.

Energy Use

Figure 97 compares the energy use and the value of motor vehicle parts and accessories production for the years 1990 through 1995. Energy use was increased by 12.4 per cent, while the the sector's GDP increased by 29.6 per cent between 1990 and 1995.

FIGURE
97

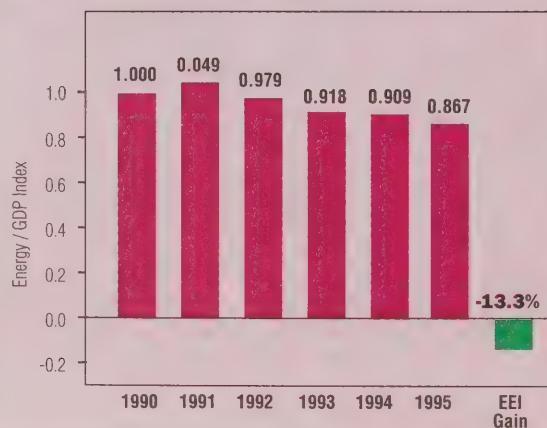
	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	22,186	20,894	20,113	22,181	25,126	24,934	12.4%
GDP (\$B\$)	5,881	5,281	5,448	6,407	7,329	7,619	29.6%
Energy / GDP	3.772	3.956	3.692	3.462	3.428	3.273	
Energy / GDP Indexed	1	1.049	0.979	0.918	0.909	0.867	

Economic Energy Intensity

The economic energy intensity of Canada's motor vehicle parts and accessories industry improved between 1990 and 1995 by 13.3 per cent. See Figure 98.

Motor Vehicle Parts and Accessories Energy / GDP Index and Economic Energy Intensity

FIGURE
98



Energy Forms

Figure 99 shows the different amounts and forms of energy used by Canada's motor vehicle parts and accessories subsector between 1990 and 1995.

FIGURE

99

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	12,162	11,670	11,034	11,938	14,101	12,922	6.2%	54.8%	52.0%
Electricity	8,829	8,071	8,002	8,960	9,593	10,242	16.0%	39.8%	41.2%
Heavy Fuel Oil	539	520	411	457	509	746	38.4%	2.4%	3.0%
Liquid Petroleum Gases	392	369	358	493	581	323	-17.6%	1.8%	1.3%
Middle Distillates	81	60	65	37	46	14	-82.7%	0.4%	0.1%
Coal	181	202	240	293	293	0	-100.0%	0.8%	0.0%
Total Energy	22,184	19,504	21,941	25,861	25,000	24,863	12.1%		

Industrial Energy Innovators, VCR Registration and Action Plans

Fifteen new Industrial Energy Innovator companies are targeted for 1997.

Case Studies

The following successful energy efficiency projects were undertaken by the motor vehicle parts and accessories subsector in 1996:

Accuride Canada Inc.

Project: Installation of power factor (PF) correction capacitors on two main substations to maintain PF above 90 per cent.
Savings: Avoidance of power factor penalty resulted in a \$6,000 per month savings in the electricity bill.
Future: replacement of 50 HP blowers with four 25 HP motors with new style system to save 650,000 Kwh / year or \$36,000.

The Woodbridge Group

Project: Conversion of a series of electrical radiant heat units to natural gas within 12 Woodbridge facilities.
Savings: Lower energy and maintenance costs with more consistent temperatures and savings of approximately \$1.9 million per year with paybacks per plant ranging from 1.2 to 3.7 years.
Future: Signed an MOU to participate in a joint voluntary initiative with the Automotive Parts Manufacturing Association (APMA), Ministry of Environment and Energy of Ontario (OMEE) and Environment Canada to reduce all areas and forms of waste, including energy.

Polywheels Manufacturing Ltd.

Project: After extensive studies of the manufacturing process and of the total facility by plant and Ontario Hydro engineers, a 3 month pilot project was initiated on the installation of insulated blankets and an insulated housing around mould units.
Future: Given positive pilot results, this will now be implemented to the rest of the process.

Transportation Task Force

Ken Rossi, Ford Motor Co. of Canada, Chairman
David Barr, Ontario Hydro
Marlene Blakeney, NRCan
Ian Campbell, CIPEC Secretariat
Dave Cherney, CAMI Automotive
Peter Corbyn, Automotive Parts Manufacturers' Association
Ivor da Cunha, Consumers Gas
Ralph Davies, Hayes-Dana
Tom Graham, General Motors of Canada
Paul Hansen, Chrysler Canada Ltd.
Dennis Onn, Ontario Ministry of Environment and Energy
Yasmin Toramohamed, Canadian Vehicles Manufacturers' Association

Economic Energy Intensity Commitment: 1995 - 2000

The motor vehicle parts and accessories subsector is committed to improving its economic energy intensity by 1.0 per cent per year for the period 1995 to 2000.

CATEGORY 2 ECONOMIC ENERGY INTENSITY

SECTOR REPORTS

	SIC	Page
● Food Processing		96
Fruit & Vegetables	103	97
Bakery Products	107	98
● Foundries		100
Iron Foundries	294	100
● Plastic Products	16	102
● Rubber Products	15	104

NOTE:

These sector reports are based on StatsCan and CIEEDAC data.

Since there are, as yet, no operational Sector Task Forces for these sectors,
there has been no industry review and validation of the data.

Food Industry

SIC 10

The food industry, SIC 10, consumed 3.4 per cent of total manufacturing and mining energy in 1995.

Three Food Sector Task Forces - Food Processing, Dairy and General Manufacturing are responsible for seven food subsectors. See Figure 100. The Food Processing and Dairy Task Forces will be operational in 1997.

Category 1 Sector

- meat and poultry - SIC 101 (See report on page 75)

Category 2 Sectors

- fruit and vegetables - SIC 103,
- bakery products - SIC 107

Category 3 Sectors

- dairy products - SIC 104 (See report on page 127)
- other food products - SIC 109
- vegetable oil mills - SIC 106
- fish & fish products - SIC 101

FIGURE
100

	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
Task Forces	Food Industry - 10	85.61	3.4%	85.74	3.4%
1 Food Processing	Meat & Poultry - 101	15.43	0.6%	10.68	0.4%
	Fruits / Vegetables - 103	9.45	0.4%	8.12	0.3%
	Bakery Products - 107	5.70	0.2%	6.52	0.2%
	Subtotal	30.59	0.01	25.32	0.01
2 Dairy	Dairy Products - 104 (1)	11.95	0.5%	12.94	0.5%
3 Gen. Manufacturing	Other Food Products - 109	19.02	0.8%*	20.70	0.8%
	Vegetable Oil Mills - 106	5.15	0.2%*	6.91	0.3%
	Fish & Fish Products - 101	3.32	0.1%*	3.92	0.1%
	Subtotal	27.49	1.1%*	31.53	1.1%
	Total	70.03**	2.8%	69.79**	2.5%
	Total M / M Energy Use	2,501.96		2,749.30	

* latest data is for 1994

** Note the food subsectors listed above represent all the subsectors for which energy use data is available at this time. They do not add up to the total for Food industry SIC 10, in part because 1994 and 1995 data are used and in part because data for other subsectors are not available.

Highlights

Three of Canada's largest food processors, Kraft Canada Ltd., Maple Leaf Foods and McCain Foods, have signed Letters of Cooperation with CIPEC. These corporations have companies and divisions operating large processing plants in the meat and poultry, fruit and vegetables, bakery and dairy sectors. As well, the Ontario Food Processors Association has signed a Letter of Cooperation with CIPEC.

The Canadian Meat Council, the Food and Consumer Products Manufacturers of Canada and the Canadian Soft Drink Association are supporting CIPEC by acquainting their members with CIPEC and energy savings opportunities.

Meat & Poultry

- This subsector used 38 per cent less energy in 1995 to produce a tonne of product than it did in 1990.

Fruit & Vegetables

- This subsector improved its economic energy intensity by over 20 per cent between 1990 and 1995.

Bakery Products

- This subsector's economic energy intensity deteriorated by 9.6 per cent between 1990 and 1995.

Fruit & Vegetables - SIC 103

Energy Use

In 1995, the fruit and vegetable industry consumed 0.3 per cent of total manufacturing and mining energy.

Figure 101 compares the energy use and the value of fruit and vegetable production for the years 1990 through 1995. Energy use decreased by 1.9 per cent, while GDP increased by 7.5 per cent over this time frame.

FIGURE

101

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	14,187	12,966	15,638	15,795	17,710	13,916	-1.9%
GDP Output (mil 86\$)	572	513	550	603	631	615	7.5%
Energy / GDP	24.802	25.275	28.433	26.194	28.067	22.628	
Energy / GDP Indexed	1	1.019	1.146	1.056	1.132	0.912	

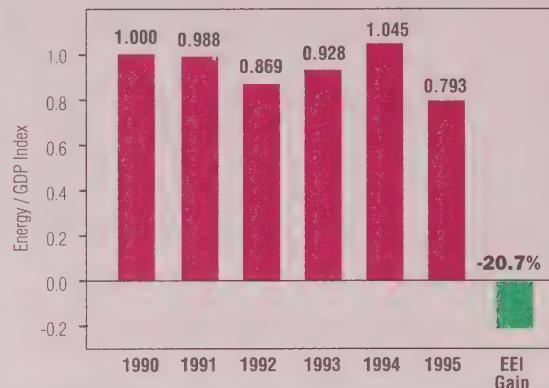
Economic Energy Intensity

The sector's economic energy intensity improved by over 20 per cent between 1990 and 1995. See Figure 102.

FIGURE

102

Fruits & Vegetables Energy / GDP Index and Economic Energy Intensity



Energy Forms

Figure 103 shows the different amounts and forms of energy used by Canada's fruit and vegetable companies between 1990 and 1995.

Natural gas and electricity were the predominant energy fuels. Steam became an important energy source in 1995 with a 10 per cent market share.

FIGURE

103

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	5,150	4,622	4,359	5,226	6,075	4,823	-6.3%	54.5%	59.4%
Electricity	1,600	1,602	1,649	1,884	1,922	1,480	-7.5%	16.9%	18.2%
Heavy Fuel Oil	2,431	3,127	1,947	2,143	2,388	1,033	-57.5%	25.7%	12.7%
Liquid Petroleum Gases	205	143	95	92	73	0	-100.0%	2.2%	0.0%
Middle Distillates	67	82	62	75	77	0	-100.0%	0.7%	0.0%
Steam	0	0	0	0	0	783	-	0.0%	9.6%
Total Energy	9,454	9,578	8,115	9,421	10,538	8,121	-14.1%		

Bakery Products - SIC 107

Energy Use

In 1995, the bakery products industry consumed 0.2 per cent of total manufacturing and mining energy.

Figure 104 compares the energy use and the value of bakery products production for the years 1990 through 1995. Energy use increased by 14.4 per cent, while GDP increased by 4.4 per cent between 1990 and 1995.

FIGURE

104

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use Terajoules)	5,701	5,739	5,442	5,616	6,336	6,522	14.4%
GDP Output (mil 86\$)	839	815	874	858	903	876	4.4%
Energy / GDP	6.795	7.042	6.227	6.545	7.017	7.445	
Energy / GDP Indexed	1	1.036	0.916	0.963	1.033	1.096	

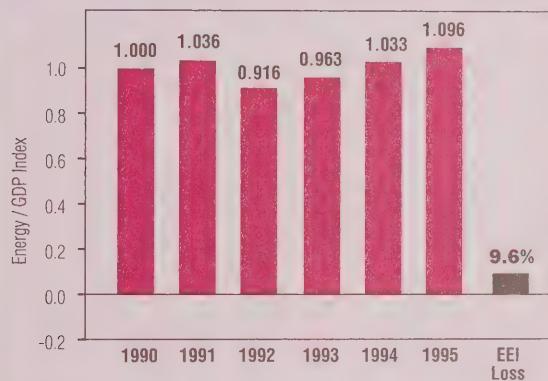
Economic Energy Intensity

The sector's energy intensity deteriorated by 9.6 per cent between 1990 and 1995. See Figure 105.

FIGURE

105

Bakery Products Energy / GDP Index and Economic Energy Intensity



Energy Forms

Figures 105 shows the different amounts and forms of energy used by Canada's bakery products companies between 1990 and 1995.

FIGURE

106

Natural gas was the predominant fuel, with electricity in second place but losing its share of sector energy use in 1995.

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	3,251	3,207	3,287	3,455	4,178	4,879	50.1%	57.0%	74.8%
Electricity	1,896	2,050	1,631	1,726	1,819	1,642	-13.4%	33.3%	25.2%
Heavy Fuel Oil	46	63	19	13	0	0	-100.0%	0.8%	0.0%
Liquid Petroleum Gases	289	179	165	194	113	0	-100.0%	5.1%	0.0%
Middle Distillates	200	234	334	227	224	0	-100.0%	3.5%	0.0%
Total Energy	5,701	5,739	5,442	5,616	6,336	6,522	14.4%		

Foundries

SIC 10

When operational in 1997, the Foundries Task Force will be responsible for six foundry subsectors:

Category 2 Sector

- Iron Foundries - SIC 294

Category 3 Sector (See report on page 129)

- Ferro Alloys - SIC 2911
- Steel Foundries - SIC 2912
- Aluminum Rolling, Casting and Extruding - SIC 296
- Copper and Copper Alloy Rolling, Casting and Extruding - SIC 297
- Other Rolled, Cast and Extruded Non-Ferrous Metal Products - SIC 299

1994 is the latest data for all six subsectors, with the exception of Ferro Alloys the latest data being for 1993. In total, the six subsectors consumed less than 1 per cent of total manufacturing and mining energy. See Figure 107

FIGURE
107

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
Foundries*	Iron Foundries - 294	7.24	0.3%	8.05	0.3%
	Aluminum Rolling, Casting & Extruding - 296	5.27	0.2%	6.39	0.2%
	Ferro Alloys - 2911**	4.64	0.2%	3.83	0.1%
	Other Rolling, Casting & Extrude (non-ferrous) 299	4.37	0.2%	3.65	0.1%
	Steel Foundries - 2912	1.33	0.1%	1.90	0.1%
	Copper Alloy, Roll, Cast & Extruding - 297	1.33	0.1%	1.73	0.1%
	Total	24.18	1.0%	25.55	0.9%
	Total M / M Energy Use	2,501.96		2,749.30	

* Task Force operational in 1997

** 1993 data

Iron Foundries - SIC 294

Industry Background

This sector is Canada's twenty-fifth largest industrial user of energy.

Energy Use

In 1994, the latest year for which energy use data is available, the iron foundries industry consumed 0.3 per cent of total manufacturing and mining energy. Figure 108 compares the energy use and the value of metal mining production for the years 1990 through 1994.

Energy use increased by 11.2 per cent, while the sector's GDP decreased by 5.0 per cent between 1990 and 1994.

FIGURE

108

	1990	1991	1992	1993	1994	90 Vs 95 % Change
Total Energy Use (Terajoules)	7,238	7,457	7,335	8,333	8,047	11.2%
GDP Output (mil 86\$)	441	381	399	423	419	-5.0%
Energy / GDP	16.413	19.572	18.383	19.700	19.205	
Energy / GDP Indexed	1	1.193	1.120	1.200	1.170	

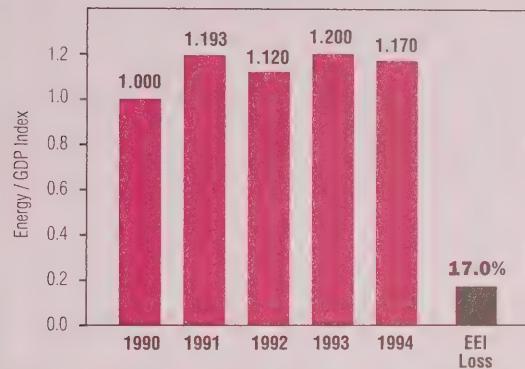
Economic Energy Intensity

The sector's economic energy intensity deteriorated by 17 per cent between 1990 and 1995. See Figure 109.

FIGURE

109

Iron Foundries Energy / GDP Index and Economic Energy Intensity



Energy Forms

Figure 110 shows the different amounts and forms of energy used by Canada's iron foundries between 1990 and 1994.

Natural gas and electricity were the predominant energy fuels, but their share of sector energy use declined over the period 1990 to 1994. On the other hand, coal increased its market share from 2 per cent in 1990 to 12.5 per cent in 1994.

FIGURE

110

Energy Consumption by Type of Energy: 1990 to 1994

Energy Use (Terajoules)	1990	1991	1992	1993	1994	90 vs. 94	1990 vs. 1994	% Change
							% of Total	
Natural Gas	4,553	3,835	3,825	3,953	3,885	-14.7%	62.9%	48.3%
Electricity	2,347	3,047	3,078	3,214	2,950	25.7%	32.4%	36.7%
Coal	147	372	293	969	1,002	581.6%	2.0%	12.5%
Liquid Petroleum Gases	141	157	95	147	139	-1.4%	1.9%	1.7%
Middle Distillates	48	42	42	47	68	41.7%	0.7%	0.8%
Heavy Fuel Oil	0	1	0	1	0	-	0.0%	0.0%
Total Energy	7,238	7,457	7,335	8,333	8,047	11.2%		

Plastic Products Industry

SIC 16

Energy Use

In 1995, the plastic products industry consumed 0.5 per cent of total manufacturing and mining energy. Figure 111 compares the energy use and the value of plastic products production for the years 1990 through 1995.

Energy use increased by 10.3 per cent, while the sector's GDP increased by 17.3 per cent between 1990 and 1995.

FIGURE

111

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	12,019	11,234	12,763	13,611	15,223	13,261	10.3%
GDP Output (mil '86\$)	1,871	1,778	1,849	1,993	2,204	2,194	17.3%
Energy / GDP	6.424	6.318	6.903	6.829	6.907	6.044	
Energy / GDP Indexed	1	0.984	1.075	1.063	1.075	0.941	

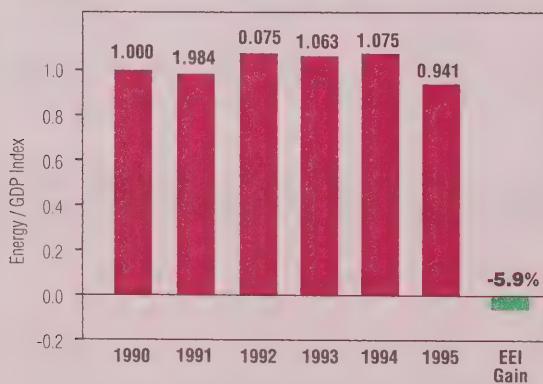
Economic Energy Intensity

The sector's economic energy intensity improved by 5.9 per cent between 1990 and 1995. See Figure 112.

FIGURE

112

Plastic Products Energy / GDP Index and Economic Energy Intensity



Energy Forms

FIGURE

113

Figure 113 shows the different amounts of energy used by the plastic products industry between 1990 and 1995.

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Electricity	6,063	6,032	7,362	7,904	8,441	7,234	19.3%	50.5%	54.6%
Natural Gas	5,517	4,800	4,969	5,359	6,241	4,924	-10.7%	45.9%	37.1%
Middle Distillates	147	132	166	172	168	0	-100.0%	1.2%	0.0%
Heavy Fuel Oil	138	103	93	24	80	0	-100.0%	1.1%	0.0%
Liquid Petroleum Gases	136	164	170	150	291	0	-100.0%	1.1%	0.0%
Coal	15	0	0	0	0	0	-100.0%	0.1%	0.0%
Total Energy	12,016	11,234	12,763	13,611	15,223	13,261*	10.4%		

* Note: In 1995, the terajoules of energy by forms do not add to the total for that year.

A Plastic Products Sector Task Force will be operational in 1997 and one of the first tasks will be to review the sector's energy use data.

Rubber Products

SIC 15

Energy Use

In 1995, the rubber products industry consumed 0.4 per cent of total manufacturing and mining energy. Figure 114 compares the energy use and the value of rubber products production for the years 1990 through 1995.

Energy use decreased by 14 per cent, while production increased by 43 per cent between 1990 and 1995.

FIGURE

114

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	9,115	8,815	9,195	9,136	8,168	10,381	13.9%
GDP Output (mil 86\$)	1,058	951	1,187	1,373	1,482	1,514	43.1%
Energy / GDP	8.615	9.269	7.746	6.654	5.511	6.857	
Energy / GDP Indexed	1	1.076	0.899	0.772	0.640	0.796	

Economic Energy Intensity

The sector's economic energy intensity improved by over 20 per cent between 1990 and 1995. See Figure 115.

FIGURE

115

Rubber Products Energy / GDP Index and Economic Energy Intensity



Energy Forms

Figure 116 shows the different amounts and forms of energy used by the rubber products industry between 1990 and 1995.

FIGURE

116

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	3,796	3,858	4,045	3,998	4,101	5,426	42.9%	41.6%	52.3%
Electricity	2,967	2,980	3,047	2,985	3,105	3,434	15.7%	32.6%	33.1%
Heavy Fuel Oil	2,174	1,849	1,937	1,959	297	1,465	-32.6%	23.9%	14.1%
Middle Distillates	44	46	57	90	537	968	2004.3%	0.5%	9.3%
Liquid Petroleum Gases	537	332	458	607	397	570	6.1%	5.9%	5.5%
Total Energy	9,115	8,815	9,195	9,136	8,168	10,381	13.9%		

Industrial Energy Innovators, VCR Registration and Action Plans

Two rubber products companies have committed to become Industrial Energy Innovators and have registered with the Voluntary Challenge Registry (VCR).

A Rubber Products Task Force will be operational in 1997.

Category 3 Sectors and Task Forces

Energy Use



NOTE:

Category 3 sectors are those sectors for which only energy use data is collected by StatsCan.

Since no physical or economic units of production are available, no PEI or EEI can be calculated for these sectors.



Category 3 Sectors

There are 47 sectors for which only energy use data is available. These sectors and their change in energy use from 1990 is shown in Figure 117.

This means neither physical energy intensity nor economic energy intensity can be calculated.

Of these 47 sectors, 1995 data is available for only 14 of them, representing 13.1 per cent of total manufacturing and mining energy use. For the remaining 33 sectors, the latest data is for 1994, except for Ferro Alloys for which only 1993 data is available.

These 33 sectors represented 6.6 per cent of total manufacturing and mining energy use, down slightly from 1990.

The challenge for CIPEC 3, StatsCan and CIEEDAC will be to determine whether physical or economic units of production can, and should, be identified for any or all of these Category 3 sectors so that a PEI or an EEI can be calculated.

FIGURE

117

Category 3 Sectors						
#	Category 3 Sectors / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total	Change
1	Organic Chemicals - 3712 (1)	128.15	5.1%	102.62	3.7%	-19.9%
2	Non Ferrous Smelting & Refining (less Al.) - 2959	84.75	3.4%	72.10	2.6%	-14.9%
3	Wood Products - 25 (2)	39.34	1.6%	56.12	2.0%	42.7%
4	Fabricated Metal Product (not mach) - 30	27.55	1.1%	35.48	1.3%	28.8%
5	Primary Textiles - 18 (3)	14.30	0.6%	25.70	0.9%	79.7%
6	Machinery Industry (ex electrical) - 31	12.64	0.5%	13.68	0.5%	8.2%
7	Dairy - 104 (4)	12.00	0.5%	12.90	0.5%	7.5%
8	Printing, Publishing - 28	8.59	0.3%	11.32	0.4%	31.8%
9	Textile Products - 19 (3)	6.70	0.3%	9.80	0.4%	46.3%
10	Other Manufacturing - 39	5.85	0.2%	7.06	0.3%	20.7%
11	Furniture and Fixtures - 26	5.20	0.2%	6.21	0.2%	19.4%
12	Clothing Industry - 24	5.16	0.2%	5.46	0.2%	6.0%
13	Leather and Allied Products - 17	1.24	0.0%	1.72	0.1%	38.9%
14	Tobacco Products - 12	1.29	0.1%	1.02	0.0%	-20.9%
	Subtotal	352.76	14.1%	361.20	13.1%	2.4%
#	Remaining Sectors / SIC	1990 Energy (PJ)	% of Total	1994 Energy (PJ)	% of Total	% Change
15	Other Food Products - 109	19.02	0.8%	20.70	0.8%	8.8%
16	Other Minerals - 3590	14.17	0.6%	15.06	0.5%	6.3%
17	Iron Foundries - 294	7.24	0.3%	8.05	0.3%	11.2%
18	Other Chemical Products - 379	6.94	0.3%	7.07	0.3%	1.9%
19	Distillery Products - 112	6.70	0.3%	4.51	0.2%	-32.7%
20	Aluminum Rolling, Casting and Extruding - 296	5.27	0.2%	6.39	0.2%	21.3%
21	Clay Products - 3510	5.16	0.2%	4.00	0.1%	-22.5%
22	Vegetable Oil Mills (ex. Corn Oil) - 106	5.15	0.2%	6.91	0.3%	34.1%
23	Paper Box and Bag Industry - 273	5.12	0.2%	5.86	0.2%	14.4%
24	Aircraft and Aircraft Parts - 321	4.97	0.2%	5.28	0.2%	6.2%

continued

FIGURE

117

# Remaining Sectors / SIC	1990 Energy (PJ)	% of Total	1994 Energy (PJ)	% of Total	% Change
25 Ferro Alloys Industries - 2911	4.64	0.2%	-	-	-
26 Other Roll, Cast & Extrude (non ferrous) 299	4.37	0.2%	3.65	0.1%	-16.4%
27 Other Converted Paper Products - 279	4.00	0.2%	4.81	0.2%	20.2%
28 Asphalt Roofing - 272	3.57	0.1%	3.30	0.1%	-7.6%
29 Fish & Fish Products - 101	3.32	0.1%	3.92	0.1%	18.2%
30 Abrasives - 3571	3.80	0.2%	2.81	0.1%	-26.1%
31 Redi-Mix - 3550	2.96	0.1%	6.59	0.2%	122.9%
32 Soap and Cleaning Compounds - 376	2.83	0.1%	2.18	0.1%	-22.8%
33 Concrete - 3540	2.79	0.1%	3.35	0.1%	20.2%
34 Steel Pipe and Tubes - 292	2.76	0.1%	2.80	0.1%	1.5%
35 Pharmaceutical and Medicines - 374	2.64	0.1%	3.96	0.1%	49.7%
36 Railroad Rolling Stock Industry - 326	2.54	0.1%	1.82	0.1%	-28.3%
37 Soft Drink -1111	1.68	0.1%	2.35	0.1%	39.8%
38 Truck and Bus Body and Trailer - 324	1.60	0.1%	1.79	0.1%	11.7%
39 Paint and Varnish Industry - 375	1.58	0.1%	1.88	0.1%	18.7%
40 Other Petroleum - 3690	1.57	0.1%	3.02	0.1%	91.9%
41 Shipbuilding and Repair - 327	1.55	0.1%	1.11	0.0%	-28.4%
42 Copper / Alloy Roll, Cast & Extrude - 297	1.33	0.1%	1.73	0.1%	29.8%
43 Steel Foundries - 2912	1.33	0.1%	1.90	0.1%	42.7%
44 Toilet Preparations - 377	0.84	0.0%	0.71	0.0%	-14.9%
45 Other Transportation Equipment - 329	0.22	0.0%	0.43	0.0%	97.3%
46 Wine Industry - 114	-	-	0.27	0.0%	-
47 Other Sectors	66.48	2.7%	71.40	2.6%	7.4%
Sub Total	171.86	6.9%	180.86	6.6%	-
Total Identified Category 3 Sectors	524.62	21.0%	542.05	19.7%	
Category 1 sectors	1,881.80	75.2%	2,112.64	76.8%	
Category 2 sectors	95.54	3.8%	94.61	3.4%	
Total M/M	2,501.96		2,749.30		

Source: StatsCan, NRCan, CIEEDAC

1. Energy use data shown in this report for the chemical sector are based on Statistics Canada's ICE Survey . The Canadian Chemical Producers' Association (CCPA) annual Reducing Emissions report covers emissions for all greenhouse gases for all of its members. The CCPA methodology does not correspond directly with the energy use data reported by StatsCan and efforts are underway to reconcile the differences.
2. Both CIEEDAC and the Wood Task Force are aware that the energy data for the Wood Products Sector need to be refined.
3. The Textiles Task Force believes that the data provided to StatsCan by its sector in 1995 are not accurate, hence this data should not be used to measure the performance of the primary textiles and textiles products sectors. It is working with StatsCan to correct these errors.
4. The National Dairy Council are reviewing the energy use data for the dairy sector, in particular the data for 1990.

Category 3 Sectors with Task Forces

Five Category 3 Sector Task Forces - General Manufacturing, Non Ferrous Smelting and Refining, Textiles, Transportation and Wood Products - are now in place. A further two - Dairy and Foundries - will be operational in 1997.

In total, these Task Forces are responsible for about 14 per cent of total manufacturing and mining energy. See Figure 118 below.

FIGURE

118

#	Category 3 Sector Task Forces / SIC	1990 Energy (PJ)	Energy as % of Total	1994 or 1995 Energy (PJ)	Energy as % of Total
1	Dairy - 104 (1)	12.00	0.5%	12.90	0.5%
2	Foundries (1)(2)				
	Ferro Alloys - 2911	4.64	0.2%	-	-
	Aluminum Rolling, Casting & Extrude - 296	5.27	0.2%	6.39	0.2%
	Other Roll, Cast, Extrude (non ferrous) - 299	4.37	0.2%	3.65	0.1%
	Steel Foundries - 2912	1.33	0.1%	1.90	0.1%
	Copper Alloy Roll, Cast & Extrude - 297	1.33	0.1%	1.73	0.1%
	Subtotal	16.94	0.7%	13.67	0.5%
3	General Manufacturing (31 sectors) (2)	163.10	6.5%	177.40	6.5%
4	Non Ferrous Smelting and Refining (less Aluminum) - 2959	84.75	3.4%	72.10	2.6%
5	Textiles (3)				
	Primary Textiles - 18	14.30	0.6%	25.70	0.9%
	Textile Products - 19	6.70	0.3%	9.80	0.4%
	Subtotal	21.00	0.8%	35.50	1.3%
6	Transportation (2)				
	Aircraft & Aircraft Parts - 321	4.97	0.2%	5.28	0.2%
	Railroad Rolling Stock - 326	2.54	0.1%	1.82	0.1%
	Truck & Bus Trailer - 324	1.60	0.1%	1.79	0.1%
	Shipbuilding & Repair - 327	1.55	0.1%	1.11	0.04%
	Boatbuilding & Repair - 328	0.24	0.01%	0.45	0.02%
	Other Transportation - 329	0.22	0.01%	0.43	0.02%
	Subtotal	11.12	0.44%	10.88	0.40%
7	Wood Industries (4)	39.34	1.6%	56.12	2.0%
	Subtotal	348.25	13.9%	378.57	13.8%
	Total M/M	2,501.96		2,749.30	

1. Task Force operational in 1997.
2. Data shown for 1995 is a combination of 1994 and 1993 data.
3. The Textiles Task Force believes that the data provided to StatsCan by its sector in 1995 are not accurate, hence this data should not be used to measure the performance of the primary textiles and textiles products sectors. It is working with StatsCan to correct these errors.
4. Both CIEEDAC and the Wood Task Force are aware that the data for the Wood Products Sector need to be refined.

CATEGORY 3 ENERGY USE

SECTOR TASK FORCE REPORTS

	SIC	Page
● General Manufacturing		112
● Non-Ferrous Smelting and Refining (less Aluminum)	2959	115
● Textiles		117
Primary Textiles		18
Textile Products		19
● Transportation Equipment Industry		120
Aircraft & Aircraft Parts		321
Truck & Bus Trailer		324
Railroad Rolling Stock		326
Shipbuilding & Repair		327
Boatbuilding & Repair		328
Other Transportation		329
● Wood Industries	25	122

General Manufacturing

The General Manufacturing Task Force is responsible for almost 10 per cent of total manufacturing and mining energy use. See Figure 119.

FIGURE

119

Task Force	Sectors / SIC	1990	% of Total	1995	% of Total
		Energy (PJ)		Energy (PJ)	
General Manufacturing	Glass & Glass Products - 356	14.2	0.6%	13.9	0.5%
				1994 Energy (PJ)	
	Category 3 (31 sectors) #	230.6	9.1%	259.4	9.4%
	Total General Manufacturing	244.8	9.7%	273.3	9.9%

Data for 31 General Manufacturing Category 3 sectors for 1990 and 1994 are estimated by CIPEC.

Category 2 Sector

- glass and glass products - SIC 356 (See report on page 89)

Category 3 Sectors

- 31 sectors (See Figure 120)

Only energy use data is available for Category 3 sectors. These sectors usually involve small to medium sized companies which:

- do not consume a significant amount of energy and energy use is not a significant cost of doing business;
- do not have the resources to participate in a Sector Task Force.

1995 data is available for only eight Category 3 sectors, representing 3 per cent of total manufacturing and mining energy use.

For the remaining sectors, the latest energy use data is for 1994. In total, 31 General Manufacturing Category 3 sectors amount to 9.4 per cent of the total manufacturing and mining energy use. See Figure 120.

FIGURE

120

Category 3 Energy Use: General Manufacturing

#	Category 3 Sectors / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total	Change
1	Fabricated Metal Product (not mach) - 30	27.5	1.1%	35.5	1.3%	28.8%
2	Machinery Industry (ex electrical) - 31	12.6	0.5%	13.7	0.5%	8.2%
3	Printing, Publishing - 28	8.6	0.3%	11.3	0.4%	31.8%
4	Other Manufacturing - 39	5.9	0.2%	7.1	0.3%	20.7%
5	Furniture and Fixtures - 26	5.2	0.2%	6.2	0.2%	19.4%
6	Clothing Industry - 24	5.2	0.2%	5.5	0.2%	6.0%
7	Leather and Allied Products - 17	1.2	0.0%	1.7	0.1%	38.9%
8	Tobacco Products - 12	1.3	0.1%	1.0	0.0%	-20.9%
	Subtotal	67.52	2.7%	81.96	3.0%	

continued

continued
FIGURE

120

Category 3 Energy Use: General Manufacturing

#	1990 Remaining Sectors / SIC	% of Energy (PJ)	1994 Total	% of Energy (PJ)	% Total	Change
9	Other Food Products - 109	19.0	0.8%	20.7	0.8%	8.8%
10	Other Minerals - 3590	14.2	0.6%	15.1	0.5%	6.3%
11	Other Chemical Products - 379	6.9	0.3%	7.1	0.3%	1.9%
12	Vegetable Oil Mills (ex. Corn Oil) - 106	5.2	0.2%	6.9	0.3%	34.1%
13	Redi-Mix - 3550	3.0	0.1%	6.6	0.2%	122.9%
14	Paper Box and Bag Industry - 273	5.1	0.2%	5.9	0.2%	14.4%
15	Other Converted Paper Products - 279	4.0	0.2%	4.8	0.2%	20.2%
16	Distillery Products - 112	6.7	0.3%	4.5	0.2%	-32.7%
17	Clay Products - 3510	5.2	0.2%	4.0	0.1%	-22.5%
18	Pharmaceutical and Medicines - 374	2.6	0.1%	4.0	0.1%	49.7%
19	Fish & Fish Products - 101	3.3	0.1%	3.9	0.1%	18.2%
20	Concrete - 3540	2.8	0.1%	3.4	0.1%	20.2%
21	Asphalt Roofing - 272	3.6	0.1%	3.3	0.1%	-7.6%
22	Other Petroleum - 3690	1.6	0.1%	3.0	0.1%	91.9%
23	Abrasives - 3571	3.8	0.2%	2.8	0.1%	-26.1%
24	Steel Pipe and Tubes - 292	2.8	0.1%	2.8	0.1%	1.5%
25	Soft Drink - 1111	1.7	0.1%	2.3	0.1%	39.8%
26	Soap and Cleaning Compounds - 376	2.8	0.1%	2.2	0.1%	-22.8%
27	Paint and Varnish Industry - 375	1.6	0.1%	1.9	0.1%	18.7%
28	Toilet Preparations - 377	0.8	0.03%	0.7	0.03%	-14.9%
29	Wine Industry - 114	-	-	0.3	0.01%	-
31	Other Sectors	66.5	2.7%	71.4	2.6%	
Sub Total		163.1	3.9%	177.5	3.9%	-
Total General Manufacturing Category 3 Sectors		230.58	9.2%	259.42	9.4%	

Note: Most of the energy use identified for Category 3 sectors in Figure 120 above is based on 1994 data. When this amount is added to the 1995 data of other sectors, the total is not exactly the same as the 1995 total for manufacturing and mining.

Industrial Energy Innovators, VCR Registration and Action Plans

There are General Manufacturing companies registered as Industrial Energy Innovators and with the VCR. Of these companies, 28 or 65 per cent have submitted action plans to the VCR.

Case Studies**Kodak Canada Inc.**

Actions: Since 1990, Kodak has put in place:

- an ongoing energy conservation and efficiency awareness program for office and production staff;
- retrofitted lighting in all buildings;
- installed occupancy maintenance programs to reduce energy losses;
- introduced peak shaving of electricity loading;
- raised chilled water and brine temperatures during non-peak production hours; and,
- installed a plate exchanger to reduce demands on cooling systems.

Savings: These actions have resulted in a 21 per cent reduction in fuel consumption and a 13 per cent reduction in electricity consumption.

Imperial Wallcoverings (Canada) Inc.

Actions: Energy savings activities during 1994 and 1995 included:

- installing new transformers;
- upgrading windows and incinerators; and,
- installing high-efficiency motors on printing presses.

Plans: Planned projects include:

- installation of capacitors to control the power factor;
- further conversion to high-efficiency electric motors;
- installation of a modulation system for incinerators; and,
- replacement of a paste oven.

General Manufacturing Task Force

Peter Notzell, Alliance of Manufacturers & Exporters Canada, Chairman

Robert Saari, Alliance, Alberta

Sandy Ferguson, Alliance, British Columbia

Jonas Sammons, Alliance, Manitoba

Gerry Cluney, Alliance, New Brunswick

Burf Ploughman, Alliance, Newfoundland

Dick Smyth, Alliance, Nova Scotia

Paul Nykanen, Alliance, Ontario

Ronald Mullins, Alliance, PEI

Physical Energy Intensity Commitment: 1995 - 2000

The general manufacturing sector is committed to improving its annual energy efficiency by 1.0 per cent for the period 1995 to 2000.

Non-Ferrous Smelting and Refining

SIC 2959

Industry Background

Non-ferrous metal smelting and refining, without aluminum, consumed about 2.6 per cent of total manufacturing and mining energy, making it Canada's ninth largest industrial user of energy.

Energy Use

Energy use was decreased by 14.9 per cent between 1990 and 1995. See Figure 121.

FIGURE

121

	1990	1991	1992	1993	1994	1995	1990 vs. 1995 % Change
Total Energy Use (Terajoules)	84,748	75,647	78,900	86,120	70,135	72,101	-14.9%

Energy Forms

Figure 122 shows the different amounts and types of energy used by Canada's non-ferrous smelting and refining sector between 1990 and 1995.

It also shows that electricity became the principal energy form consumed, replacing natural gas, while coal and natural gas consumption fell somewhat over the period.

FIGURE

122

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Electricity	29,185	25,839	26,415	27,011	31,875	33,871	16.1%	35.6%	47.0%
Natural Gas	30,866	31,221	31,228	31,118	16,996	18,555	-39.9%	37.7%	25.7%
Coal	12,823	10,131	13,125	9,474	9,898	9,613	-25.0%	15.7%	13.3%
Heavy Fuel Oil	4,980	4,491	2,863	4,524	4,499	4,301	-13.6%	6.1%	6.0%
Coke	1,992	2,003	2,721	2,447	2,526	2,571	29.1%	2.4%	3.6%
Petroleum Coke	891	697	1,249	0	2,562	1,628	82.7%	1.1%	2.3
Middle Distillates	793	688	794	725	799	755	-4.8%	1.0%	1.0%
Liquid Petroleum Gases	386	305	414	560	362	557	44.3%	0.5%	0.8%
Steam	0	0	0	0	0	228	-	0%	0.3%
Total	81,919	75,379	78,813	75,863	69,521	72,100	-12.0%		

Note: The total energy use by year does not agree with the totals set out in Figure 121 above. This anomaly is being investigated by CIEEDAC.

Over the coming year, the Task Force will be working with NRCan, StatsCan and CIEEDAC to reconcile various surveys involving the mining and smelting and refining industries and to develop criteria to more accurately allocate energy use among those sectors.

Industrial Energy Innovators, VCR Registration and Action Plans

Brunswick Smelting and Refining, Canadian Electrolytic Zinc Limited, Cominco, Falconbridge Ltd., Inco Limited, Noranda Metallurgy Inc. and Hudson Bay Mining & Smelting, representing 100 per cent of Canada's total non-ferrous smelting and refining production, have committed to become Industrial Energy Innovators and have registered with the Voluntary Challenge Registry (VCR). Four of these companies have also submitted action plans to the VCR.

Case Study

Inco Limited

The Ontario Division of Inco Limited has lowered its energy consumption by more than 35 per cent in the last 15 years through a combination of operational and process changes. More than 15 per cent of this improvement has taken place in the last three years.

Operational Improvements

These include:

- the installation of energy efficient lighting and motion sensors;
- the use of high-efficiency electric motors and variable speed drives;
- improved compressed air usage;
- electrical load shifting;
- making energy efficiency an integral part of engineering design standards; and,
- an education program consisting of videos, posters, articles in the company's employee publications and an energy awareness program for new employees.

Process Changes

These include:

- the completion of a \$600 million Sulphur Dioxide Abatement Project in 1994, the largest corporate environmental undertaking in Canadian history,
- process improvements at the Clarabelle Mill which reduced electric energy consumption at the mill from 34.8 KWh / ton of ore in 1991 to 27.4 KWh / ton in 1996, a 21.3 per cent reduction.

Falconbridge, Sudbury Division

Projects: In 1994, Falconbridge mothballed one of its two electric furnaces at its Sudbury Division.

The second furnace was enlarged, the electrical power supply and furnace electrode control system were modified to improve the power factor and power regulation. Modifications to the slag handling system lowered energy requirements.

Savings: These process technology improvements have resulted in an 11 per cent improvement in energy efficiency.

Noranda, Canadian Copper Refinery (CCR), Montreal

Over the past five years, CCR has undertaken a variety of energy efficiency initiatives, resulting in annual energy savings of 24 per cent (600,000 MMbtu), or more than \$2.5 million per year.

Non Ferrous Smelting and Refining Mining Task Force

Milt Goble, INCO Manitoba Division, Chairman

Anthony Howard, Echo Bay

Peter McBride, Ontario Mining Association

Paul Huszti, Cominco Metals

Keith Eldridge, Iron Ore Company

John LeMay, INCO Ontario Division

Rick Geren, Noranda

Henry Smith, Williams Operating

Lauri Gregg, Falconbridge Ltd.

Gerry Vallianotos, Falconbridge Ltd.

Kees Versfeld, Syncrude

Physical Energy Intensity Commitment: 1995 - 2000

The non-ferrous smelting and refining sector is committed to improving its physical energy intensity by 1.0 per cent per year for the period 1995 to 2000.

Textiles

The textiles sector comprises two subsectors:

- primary textiles - SIC 18, and
- textile products - SIC 19.

The primary textiles and textile products sectors, together, consumed about 1.2 per cent of total manufacturing and mining energy, making them Canada's fifteenth largest industrial user of energy.

Canada's textile industry has annual sales of over \$8 billion, including the export of product worth more than \$2.5 billion. The industry includes producers of man-made fibres and filament yarns, spun yarns, fabrics and a wide range of textile products for the consumer and industrial markets. Textile manufacturers sell to 150 markets including agriculture, automotive, clothing, construction, environmental protection, and road building.

Over the past 15 years the industry has been transformed through substantial and sustained capital investment. While not a significant energy user, the textile industry's annual energy bill is approximately \$200 million.

Textile Sector Task Force Comment

There are errors and inconsistencies in the 1995 energy consumption data reported by firms to Statistics Canada. The Textile Energy Task Force is working with StatsCan to correct these errors. This work could not be completed in time to include a meaningful and accurate analysis of the textile industry's energy efficiency performance in this report.

As soon as this analysis is complete and the errors and inconsistencies corrected, a supplementary sector report will be issued.

Industrial Energy Innovators, VCR Registration and Action Plans

Thirty textile companies have committed to become Industrial Energy Innovators and have registered with the Voluntary Challenge Registry (VCR). This number is expected to increase to 50 in 1997.

In 1996, the Textile Energy Task Force held two energy conferences, (one in Toronto, the other in St. Hyacinthe, Quebec). The objective was to highlight case studies and to provide individual firms with the basics necessary to establish energy efficiency improvement programs.

In 1997, the Task Force will:

- provide assistance to each Industrial Energy Innovator company to help it implement energy efficiency projects / programs;
- publish a monthly energy efficiency newsletter in English and French; and,
- develop a TEMPLATE or MODEL Action Plan for consistency in Industrial Energy Innovator reporting.

Case Studies

C. S. Brooks, Canada Inc.

Projects: This company has a number of energy efficiency projects underway, including:

- reduction of all compressor leaks;
- utilizing compressor cooling water for boiler feed; and
- the installation of a Lydell heat reclaim unit in its bleaching area.

Savings: The savings from these initiatives are a reduction of 41,172 kWh and 24,457 Gigajoules of natural gas.

Future Initiatives: The company plans a complete revamp of its "steam trap" maintenance program.

Cambridge Towel Corporation

Projects: This company has formed an in-house cost reduction team that:

- redesigned its dye house and weaving operation, resulting in the installation of 30 new "efficient" looms replacing 50 older looms; and,
- redesigned the company's steam generating system, replacing three 300 HP Clayton boilers with three 200 HP Miura boilers.

Savings: The savings from these initiatives from 1994 through 1996, expressed in COST / LB have been:

- a 46 per cent reduction in the amount of natural gas used;
- a 38 per cent reduction in the amount of electricity used;
- a 58 per cent reduction in the amount of water used.

Future Initiatives:

The company plans a complete redesign of its finishing department and a sub-station upgrade from 1600 to 2500 amp with peak load monitors.

Canada Hair Cloth Co. Limited

Projects: This company has taken the following initiatives:

- the replacement of incandescent lights;
- the installation of high efficiency lamps and energy saving ballasts upon burnout;
- the reduction of water temperature; and,
- the installation of high efficiency motors.

Savings: Electricity savings of 113,165 Kwh have resulted.

Dupont Canada Inc. (Kingston Plant)

Projects: This company has undertaken a number of energy efficiency improvement initiatives, including:

- the detection and repair of air leaks;
- the replacement of Powerhouse traps on compressors;
- the optimization of its HVAC system; and,
- the installation of new controls on four chillers.

Savings: The savings from these initiatives include:

- air leak repair - \$50,000 a year;
- replacement of Powerhouse traps - \$72,000 a year;
- HVAC optimization - \$84,000 a year; and,
- installation of new chiller controls - \$61,000 a year.

Consoltex Inc.

Projects: This company has undertaken a number of initiatives, including:

- improved power factor;
- improvements in its pit and boiler room compressors;
- reduced air leaks;
- computerized consumption controls; and,
- improved pre-heat system, including converting it to natural gas.

Consoltex Inc.

Savings: The savings per year from these initiatives are:

- power factor - \$60,000, with a 1.2 year payback;
- weaving pit and boiler room compressor displacement - \$15,000, with a 4 month payback;
- reduction of air leaks - \$16,000; and,
- computerized consumption control - \$210,000 with a 1.7 year payback.

J.L. de Ball Canada Inc.

Projects: This company has two main initiatives:

- the recuperation of waste water heat for use in Dye House water; and,
- the conversion of hot dryer and two air make-up units from steam to direct gas.

Future Initiatives:

The company plans to:

- focus on employee participation and awareness, enhance O & M procedures and equipment modifications and / or upgrades; and,
- establish specific, real, attainable, yet challenging, performance targets.

Swift Textiles, Drummondville

Projects: This company has invested in energy efficiency improvement measures, involving the active participation of all hourly paid employees and management, raising the awareness and importance of energy efficiency.

Savings: After one year, energy savings of \$192,300 have been achieved.

Future Initiatives:

The company plans a complete redesign of its finishing department and a sub-station upgrade from 1600 to 2500 amp with peak load monitors.

Textile Products Task Force

Peter Chantraine, DuPont Canada Inc., Chairman

Eric Barry, Canadian Textile Institute

Abraham Turkson, Albarrie Canada Limited

Jacques Boutin, Consoltex Inc.

Cecile Miclette, Albarrie Environmental Services

Louise Metivier, Natural Resources Canada

Gilles Charron, Dominion Textile Inc.

Rene Nantel, Peerless Carpet Corporation

Ian Campbell, CIPEC Secretariat

Pierre Beeks, J. L. de Ball Canada Inc.

Roger Leclerc, Centre des technologies textiles

Pierre de Broux, Intech PEM Inc.

Physical Energy Intensity Commitment

The textile sector is committed to improving its physical energy intensity by 2.0 per cent per year for the period 1996 to 2000. Each year the target is reviewed by the Task Force for possible revision.

Transportation Equipment Industry

SIC 32

The transportation equipment industry (SIC 32) is made up of eight subsectors for which the quality and detail of energy and related data varies widely.

Currently, the Transportation Task Force reports on two of seven transportation sectors:

Category 1 Sector

- motor vehicles - SIC 3231 (See report on page 61)

Category 2 Sector

- motor vehicle parts and accessories - SIC 325 (See report on page 94)

Category 3 Sectors

- aircraft and aircraft parts - SIC 321
- truck and bus trailer - SIC 324
- railroad rolling stock - SIC 326
- shipbuilding and repair - SIC 327
- boat building & repair - SIC 328
- other transportation - SIC 329

The transportation equipment industry consumed 2.2 per cent of total manufacturing and mining energy in 1995. Of this amount, the motor vehicle assembly and motor vehicle parts and accessories sub sectors consumed 82 per cent (41 per cent respectively). 1995 data is available for these sectors.

The aircraft, railroad rolling stock, and truck and bus sub-sectors account for most of the remaining 18 per cent of the energy used by the other six subsectors. 1994 data only is available for these sub-sectors. See Figure 123.

FIGURE

123

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 or 1994 Energy (PJ)	% of Total
Transportation	Transportation Equipment - 32	52.423	2.1%	60.2	2.2%
	Motor Vehicle Parts - 325	22.19	0.9%	24.93	0.9%
	Motor Vehicles - 3231	18.76	0.7%	24.86	0.9%
	Aircraft & Aircraft Parts - 321*	4.97	0.2%	5.28	0.2%
	Railroad Rolling Stock - 326*	2.54	0.1%	1.82	0.1%
	Truck & Bus Trailer - 324*	1.60	0.1%	1.79	0.1%
	Shipbuilding & Repair - 327*	1.55	0.1%	1.11	0.04%
	Boatbuilding & Repair - 328*	0.24	0.01%	0.45	0.02%
	Other Transportation Equipment - 329*	0.22	0.01%	0.43	0.02%
	Total	52.07	2.1%	60.67**	2.21%
	Total M / M Energy Use	2,501.96		2,749.30	

* 1994 data. Therefore the total for all subsectors is a combination of 1994 and 1995 data.

** This total is greater than the overall sector total because it is a combination of 1994 and 1995 data.

Highlights

Motor Vehicles

- This sector's physical energy intensity worsened between 1990 and 1995 so that it took 6.8 per cent more energy to produce a vehicle in 1995 than it did in 1990.

Motor Vehicle Parts and Accessories

- This sector's economic energy intensity improved between 1990 and 1995 so that it took 13.3 per cent less energy in 1995 than it did in 1990 to achieve the same dollar value of production

Energy Use

Five transportation sub sectors - aircraft and aircraft parts, railroad rolling stock, truck, and bus body and trailer, shipbuilding and repair and other transportation equipment - for which the latest energy use data is 1994, in total, consumed only 0.38 per cent of Canada's total manufacturing and mining energy. Their energy use declined both in absolute and relative terms between 1990 and 1994.

The Transportation Task Force will be determining whether some or all of these Category 3 subsectors should be added to the ICE survey so that more up-to-date data can be collected, including physical or economic units of production.

Transportation Task Force

Ken Rossi, Ford Motor Co. of Canada, Chairman

Ralph Davies, Dana Canada

David Barr, Ontario Hydro

Tom Graham, General Motors of Canada

Marlene Blakeney, NRCan

Paul Hansen, Chrysler Canada Ltd.

Ian Campbell, CIEC Secretariat

Dennis Onn, Ontario Ministry of Environment and Energy

Dave Cherney, CAMI Automotive

Yasmin Toramohamed, Canadian Vehicles Manufacturers' Association

Peter Corbyn, Automotive Parts Manufacturers' Association

Ivor da Cunha, Consumers Gas

Wood Industry

SIC 25

Industry Background

This sector comprises over 3,000 establishments and is Canada's twelfth largest industrial user of energy.

Energy Use

The wood products energy consumption data (as collected from industry by StatsCan) did not include data for wood waste prior to 1995.

This omission significantly distorts the types of energy used by this sector. As a result, a meaningful and accurate analysis of the sector's energy use and energy intensity performance could not be made prior to the publication of this CIPEC Annual Report. The sector's performance will be reported on in next year's Annual Report using 1995 as a base.

Based on reported StatsCan and CIEEDAC data, however, in 1995 the wood products industry consumed 2.0 per cent of total manufacturing and mining energy.

In presenting its data, CIEEDAC stated that it has been known for some time that the wood products industry uses wood waste to fire its drying kilns and to generate heat for other purposes. However, the quantity of wood waste consumed has never been tallied in either the QRESD or ASM. This data began to be collected in the 1995 ICE Survey.

Historically, wood products operations were not sent ICE surveys. Wood waste consumed, when recorded, was assigned to pulp and paper operations. Some of the energy generated from wood waste may have provided heat for drying in attached "wood rooms", but this energy was never allocated to the wood products industry.

With the expansion of the 1995 ICE survey, StatsCan received for the first time some indication of the quantity of wood waste used in the wood products industry. If estimates of wood waste consumption from some provincial agencies were added to the StatsCan totals, there would be little difference in energy consumption between 1990 and 1995. To maintain a comprehensive, credible data base, however, only Statistics Canada data will be used to develop performance measures.

Industrial Energy Innovators, VCR Registration and Action Plans

More than twenty of Canada's largest integrated wood, pulp and paper companies representing a significant portion of Canada's total wood industry production have committed to become Industrial Energy Innovators and three have registered with the VCR and have submitted action plans to it.

Case Studies

In recent years, more value is being added in sawmills to both wood and residues. On the wood side, marketability is improved through drying lumber which was previously shipped green and also to improve efficiency through finger-jointing, etc. On the residue side, incineration is being improved.

Energy is being used more efficiently as many sawmills in British Columbia have improved their air compression systems and dry kiln operations. Some mills have also improved wood residue conveying by changing from blowers to belt systems.

Wood Industry Task Force

Dick Bryan, Council of Forest Industries, Chairman

Physical Energy Intensity Commitment: 1995 - 2000

The wood industry sector is committed to improving its physical energy intensity by 1.0 per cent per year for the period 1995 to 2000.

CATEGORY 3 ENERGY USE

SECTOR REPORTS

	SIC	Page
● Chemical Products		125
Organic Chemicals	3711	125
● Dairy Products		104
● Foundries		129
Ferro Alloys	2911	
Steel Foundries	2912	
Aluminum Rolling, Casting & Extruding		296
Copper Alloy, Rolling, Casting & Extruding		297
Other Rolling, Casting & Extruding (non-ferrous)	299	
● Non-Metal Mines		130
Other Non-Metal Mines	629	130

NOTE

These sector reports are based on StatsCan and CIEEDAC data. Because there are as yet no operational Task Forces for these sectors, there has been no industry review and validation of the data.

Chemical Products

SIC 37

The chemical products sector - SIC 37 - includes a number of major energy consuming sub-sectors. The three dealt with in this report are:

Category 1 Sectors

- industrial inorganic chemicals - SIC 3711 (See report on page 70)
- plastic and synthetic resins - SIC 3731.

Category 3 Sector

- industrial organic chemicals - SIC 3712,

Industrial organic and inorganic chemicals account for nearly two-thirds of the energy consumed by SIC 37. In total, organic, inorganic and plastic and resins accounted for 7.4 per cent of total manufacturing and mining energy use. See Figure 124.

FIGURE

124

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1995 Energy (PJ)	% of Total
Chemical Products	Chemical Products - 37	273.90	10.9%	274.24	10.0%
	Organic Chemicals - 3712	128.15	5.1%	102.62	3.7%
	Inorganic Chemicals - 3711	71.42	2.9%	73.23	2.7%
	Plastic & Resins - 3731	17.37	0.7%	28.30	1.0%
	Total	216.94	8.7%	204.15	7.4%
	Total M / M Energy Use	2,501.96		2,749.30	

Over the coming year, the Canadian Chemical Producers Association (CCPA) will continue to work with Statistics Canada, CIEEDAC and Environment Canada to reconcile the data collected on the chemical products sectors with the industry's own data.

Organic Chemicals - SIC 3711

Energy Use

Organic chemical production consumed 3.7 per cent of Canada's industrial energy in 1995. Figure 125 below compares the total energy use for the years 1990 through 1995. In essence, the sector used 20 per cent less energy in 1995 than in 1990, while production was 6 per cent lower.

FIGURE

125

	1990	1991	1992	1993	1994	1995	90 vs. 95 % Change
Total Energy Use (Terajoules)	128,150	115,627	106,825	82,874	103,563	102,618	-19.9%

Source: StatsCan, NRCan, CIEEDAC

Energy use data shown in this report for the chemical sector are based on Statistics Canada's ICE Survey. The Canadian Chemical Producers' Association (CCPA) annual Reducing Emissions report covers emissions for all greenhouse gases for all of its members. The CCPA methodology does not correspond directly with the energy use data reported by StatsCan.

Energy Forms

Figure 126 shows the different amounts and types of energy used by Canada's organic chemical industry between 1990 and 1995.

FIGURE
126

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	95,795	82,900	78,536	62,290	85,471	79,696	-16.8%	74.8%	77.7%
Steam	12,974	15,681	10,574	6,439	4,854	10,313	-20.5%	10.1%	10.0%
Electricity	14,371	13,155	14,763	10,415	8,156	8,965	-37.6%	11.2%	8.7%
Heavy Fuel Oil	2,153	1,706	1,462	3,333	4,536	2,982	38.5%	1.7%	2.9%
Middle Distillates	56	55	3	3	3	626	1017.9%	0.0%	0.6%
Liquid Petroleum Gases	2,798	2,128	1,486	391	540	33	-98.8%	2.2%	0.0%
Total Energy	128,150	115,627	106,825	82,874	103,563	102,618	-19.9%		

Dairy Products

SIC 104

Industry Background

The dairy processing sector is the second largest food industry in Canada accounting for 17 per cent of the value of the food and beverage processing industry and employing just under 23,000 people. The value of dairy processing shipments in 1994 exceeded \$7 billion.

Energy Use

In 1995, the dairy sector consumed less than 0.5 per cent of total manufacturing and mining energy, making it the twenty-fourth largest energy user. The industry used 8.2 per cent more energy in 1995 than in 1990. See Figure 127.

In 1995, the industry used 179.6 megajoules of energy to process one hectolitre of milk.

FIGURE
127

	1990	1991	1992	1993	1994	1995	90 vs. 95 % Change
Total Energy Use (Terajoules)	11,952	11,485	10,798	10,356	12,354	12,938	8.2%

Energy Forms

Figure 128 shows the different amounts and forms of energy used by Canada's dairies between 1990 and 1995.

FIGURE
128

Energy Consumption by Type of Energy: 1990 to 1995

Energy Use (Terajoules)	1990*	1991	1992	1993	1994	1995	% Change 90 vs. 95	1990 % of Total	1995 % of Total
Natural Gas	7,159	6,624	6,185	6,032	7,929	8,834	23.4%	59.9%	68.3%
Electricity	3,145	3,173	3,121	3,067	3,293	3,904	24.1%	26.3%	30.2%
Heavy Fuel Oil	832	936	577	461	523	199	-76.1%	7.0%	1.5%
Liquid Petroleum Gases	403	424	451	484	373	0	-100.0%	3.4%	0.0%
Middle Distillates	326	282	455	309	216	0	-100.0%	2.7%	0.0
Total Energy	11,952	11,485	10,798	10,356	12,354	12,938	8.2%		

* 1990 energy data by form does not equal StatsCan's total energy use for that year.

A Dairy Task Force will be operational in 1997. Preliminary meetings of a core working group of the Dairy Task Force were held in 1996.

This core working group reviewed StatsCan's energy use data for the sector and questioned its accuracy particularly for the period 1990 to 1994. Setting a baseline year and establishing an energy efficiency goal between January 1, 1997 and December 31, 2000 will be the first priority at early meetings of the Dairy Sector Task Force.

When its work is complete, an addendum will be issued. In the meantime, the data shown for the dairy sector should be considered preliminary.

Dairy Task Force (Core Working Group)

Catherine Tokarz, Chairman
David McLellan, Amalgamated Dairies Ltd.
Len de Boer, Dairyworld
Mac Murray, Scotburn Dairy Group
Marc Gosselin, Groupe Lactel
Donald Snyder, Beatrice
Robert McComb, Kraft Canada Inc.
Phyllis Tanaka, Ontario Dairy Council

Foundries

SIC 10

When operational in 1997, the Foundries Task Force will be responsible for six foundry sectors:

Category 2 Sector

- Iron Foundries - SIC 294 (See report on page 100)

Category 3 Sector

- Ferro Alloys - SIC 2911
- Steel Foundries - SIC 2912
- Aluminum Rolling, Casting and Extruding - SIC 296
- Copper and Copper Alloy Rolling, Casting and Extruding - SIC 297
- Other Rolled, Cast and Extruded Non-Ferrous Metal Products - 299

1994 data is the latest available for all sectors, with the exception of Ferro Alloys the latest data for which is 1993. In total, the six sectors consumed less than 1 per cent of total manufacturing and mining energy use. See Figure 129.

FIGURE

129

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1994 Energy (PJ)	% of Total
Foundries*	Iron Foundries - 294	7.24	0.3%	8.05	0.3
	Aluminum Rolling, Casting & Extruding - 296	5.27	0.2%	6.39	0.2%
	Ferro Alloys - 2911 **	4.64	0.2%	3.83	0.1%
	Other Rolling, Casting & Extrude (non-ferrous) 299	4.37	0.2%	3.65	0.1%
	Steel Foundries - 2912	1.33	0.1%	1.90	0.1%
	Copper Alloy, Roll, Cast & Extruding - 297	1.33	0.1%	1.73	0.1%
	Total	24.18	1.0%	25.55	0.9%
	Total M / M Energy Use	2,501.96		2,749.30	

* Task Force operational in 1997

** 1993 data

Non-Metal Mining

SIC 62

Total energy use in the non-metal mining sector in 1995 amounted to 43,753 terajoules. This sector comprises five subsectors as illustrated in Figure 130.

FIGURE

130

Task Force	Sector / SIC	1990 Energy (PJ)	% of Total	1994 Energy (PJ)	% of Total
Non Metal Mining	Non Metal Mining - 62	40.14	0.02	43.75	1.6%
	Other Non-Metal Mines - 629	6.59	0.3%	10.69	0.4%
	Peat Industry - 622	0.66	0.0%	0.79	0.0%
	Gypsum - 623	0.58	0.0%	0.50	0.0%
	Asbestos - 621	4.91	0.2%	0.00	0.0%
	Total	40.14	1.6%	43.75	1.6%
	Total M / M Energy Use	2,501.96		2,749.30	

*Potash, which for StatsCan purposes is part of Non-Metal Mining, is reported on in the Chemical Fertilizer sector.

With the exception of Other Non-Metal Mines (a Category 3 sector), all of the other subsectors are Category 1 sectors.

Category 1 sectors

- asbestos mines - SIC 621 (See report on page 77)
- peat industry - SIC 622 (See report on page 78)
- gypsum mines - SIC 623 (See report on page 80)

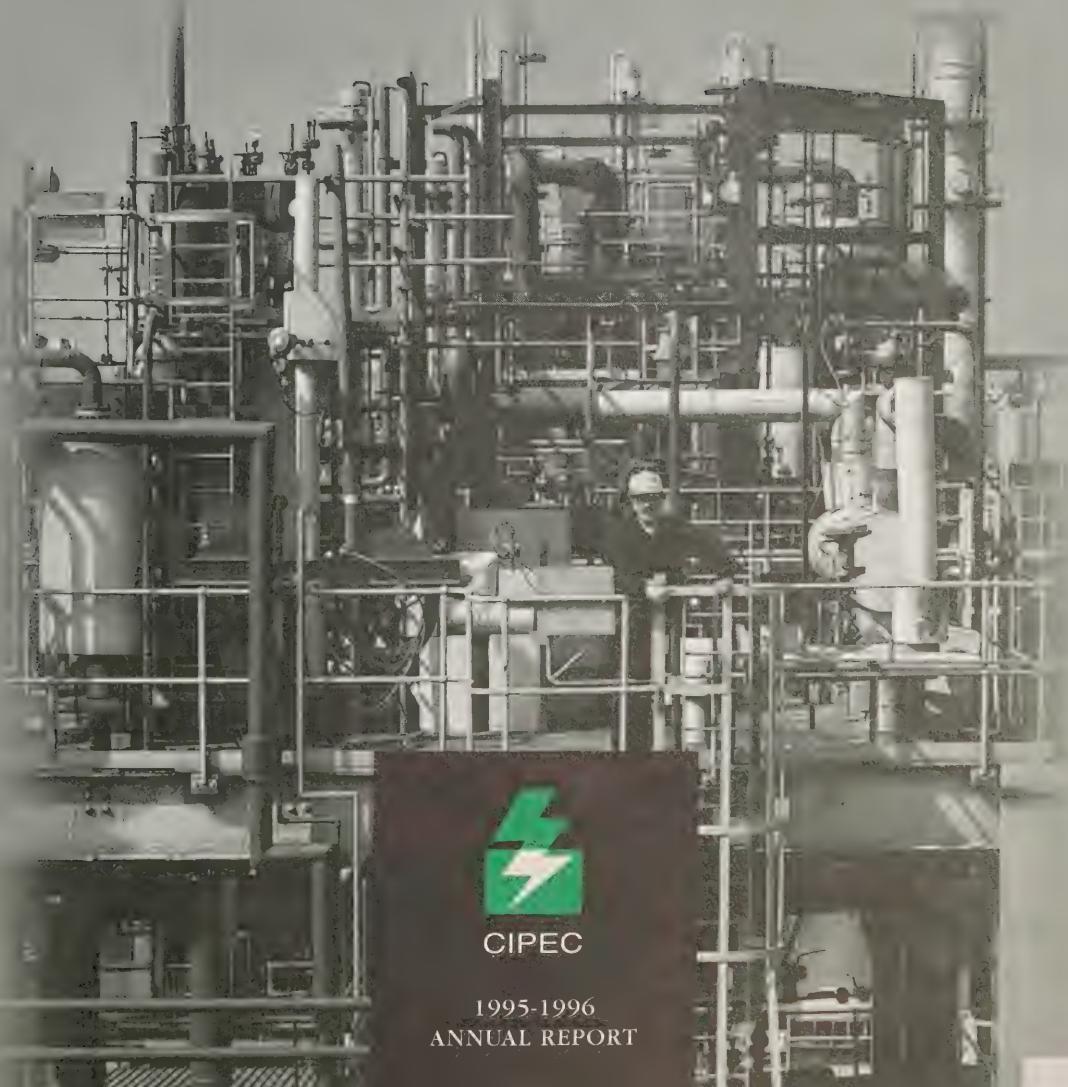
Category 3 sector

- other non-metal mines - SIC 629

Other Non-Metal Mines - SIC 629

In 1995, other non-metal mines represented just over 24 per cent of total non-metal mining energy use. This subsector is growing faster than any other non-metal mining subsector, even without the inclusion of the energy from the asbestos subsector which was included in SIC 629 in 1995.

**Exports of Embodied Energy
and Carbon dioxide,
Carbon dioxide Emission Performance,
Voluntary Challenge and Registry,
and Service to Industry**



1995-1996
ANNUAL REPORT

Embodied Energy Contained in Manufacturing and Mining Exports in 1995

Canada is a major exporter, particularly of processed and semi-processed natural resources. As a result, a significant amount of energy used in the production of manufactured or refined products is exported. For purposes of this report, this is called "embodied energy".

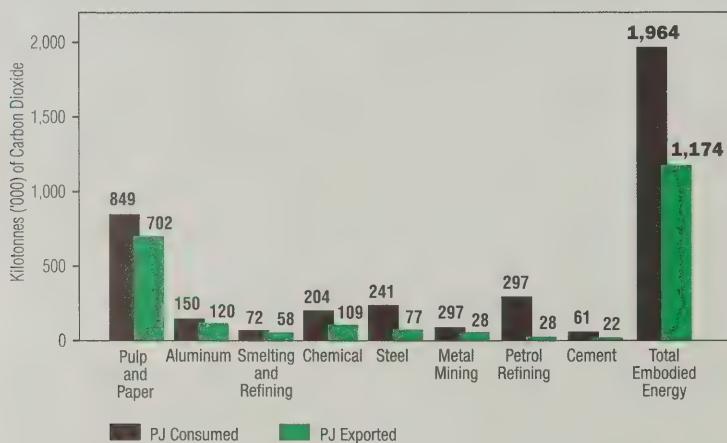
Eight industrial sectors - pulp and paper, aluminum, smelting and refining, chemicals, steel, metal mining, petroleum refining, and cement, representing 71.4 per cent of total manufacturing and mining energy use, as a group - exported 60 per cent of their output in 1995.

This amounts to 1,174 petajoules of embodied energy or 43 per cent of all manufacturing and mining energy use in 1995 is contained in the exports of these eight industrial sectors.

FIGURE

131

Exports of Embodied Energy



Historic and forecast energy use data shown in this report for the chemical sector are based on StatsCan's ICE survey as for other CIPEC sectors. The Canadian Chemical Producers' Association (CCPA) annual Reducing Emissions report covers emissions and projections for all greenhouse gases for all its members. The CCPA methodology does not correspond directly with the energy use data reported by StatsCan and efforts are underway to reconcile the data.

Unfortunately, exports of embodied energy are not yet taken into account when comparing one country's energy consumption with another. The usual measurement is per capita consumption of energy.

Per capita comparisons which do not take into account embodied energy, may be simplistic and an inaccurate way to compare one country's energy intensity performance with another.

Carbon dioxide and Other Greenhouse Gas Emissions

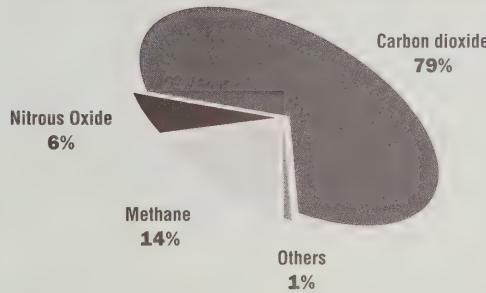
Introduction

Greenhouse gas emission reduction is the focus of the Voluntary Challenge Registry (VCR). The principal focus of manufacturing and mining companies, however, is improved competitiveness through energy efficiency, thereby reducing greenhouse gas emissions.

Greenhouse gases include carbon dioxide, methane, nitrous oxide and perfluorocarbons and sulfur hexafluoride.

Carbon dioxide is the most important greenhouse gas because it accounts for about 79 per cent of the infrared absorption due to all greenhouse gas emissions. See Figure 132.

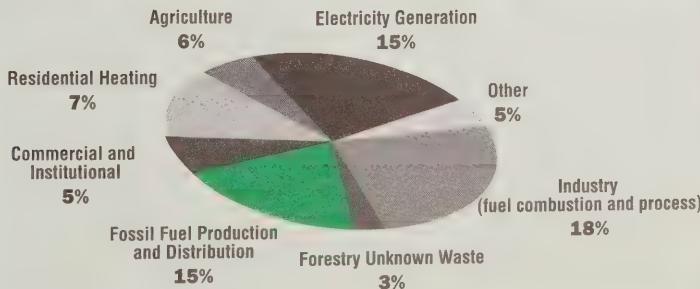
FIGURE 132 1994 Canadian Greenhouse Gas Emissions by Type of Gas



Source: Trends in Canada's Greenhouse Gas Emissions, page v

In 1994, Canada contributed 615 million metric tonnes of greenhouse gases to the atmosphere, about 2 per cent of global carbon dioxide emissions. Of these, approximately 75 per cent were attributable to the combustion of fossil fuels.

FIGURE 133 Greenhouse Gas Emissions by Sector: 1994



Source: Trends in Canada's Greenhouse Gas Emissions, page v

Since 1975, CIPEC has focused on energy efficiency improvements, with progress being measured in terms of physical energy intensity or economic energy intensity.

With the 1992 Rio Accord and Canada's subsequent introduction of its National Action Program on Climate Change, governments have focused on greenhouse gas emissions, particularly carbon dioxide emissions.

In 1994, CIPEC made the following commitment to the Minister of Natural Resources:

Industry can achieve 1990 levels of carbon dioxide emissions by the year 2000, assuming industrial GDP grows at or below 2 per cent a year between 1995 and 2000.

That statement still stands.

Carbon dioxide Emissions Performance: 1990 to 1995

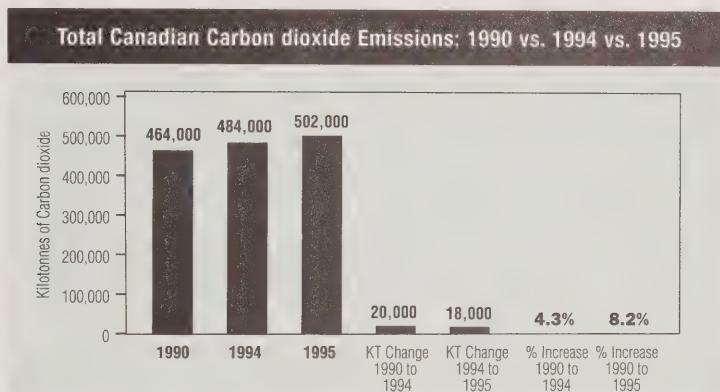
Environment Canada is responsible for calculating Canada's carbon dioxide and other greenhouse gas emissions statistics and for maintaining the official inventory.

Total Canadian Carbon dioxide Emissions

Total carbon dioxide emissions in Canada for all sectors of the economy increased by 8.2 per cent over the period 1990 to 1995, as compared to an 11.3 per cent increase in energy use over the same period.

As will be seen in Figure 134, the increase in carbon dioxide emissions between 1994 and 1995 approximates the increase between 1990 and 1994.

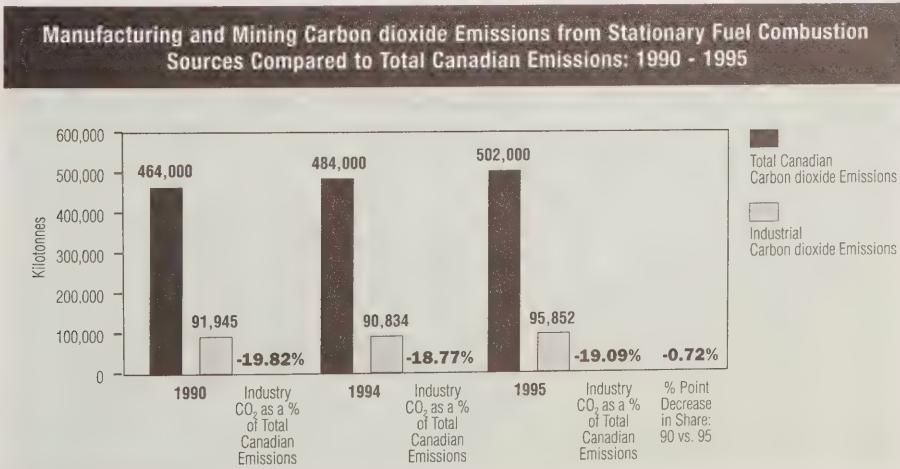
**FIGURE
134**



Manufacturing and Mining Carbon dioxide Emissions

Manufacturing and mining carbon dioxide emissions, as a percentage of total Canadian carbon dioxide emissions, declined from 19.8 per cent to 19.1 per cent, between 1990 and 1995. See Figure 135.

**FIGURE
135**



Sector Performance

Three manufacturing and mining sectors - petroleum refining, oil sands upgraders and steel - now measure their carbon dioxide emission performance.

Each sector is measured in terms of its:

- **absolute carbon dioxide emissions**

- these are actual carbon dioxide emissions using emission factors applied to energy consumption. Canada's international commitment and progress is measured in tonnes of carbon dioxide emitted.

- **physical carbon dioxide intensity (PCDI)**

- this measure relates a sector's absolute carbon dioxide emissions to a physical unit of output, for example kilotonnes of iron ore produced.

- **avoided carbon dioxide emissions**

- this measure calculates the volume of carbon dioxide emissions that would have been released had the base year's (1990) carbon dioxide intensity been experienced in 1995 based on the production level in 1995. Avoided carbon dioxide emissions, then, result from improved carbon dioxide intensities.

Oil Sands Upgraders SIC 712

Absolute Carbon dioxide Emissions

The carbon dioxide emissions of the oil sands sector increased by 31.4 per cent between 1990 and 1995, however, production increased over 57 per cent. Between 1994 and 1995, the sector's carbon dioxide emissions fell slightly, while production increased by over 5 per cent.

FIGURE

136

Oil Sands Upgraders	1990	1994	1995	95 vs. 90 KT Change	95 vs. 90 % Change	95 vs. 94 KT Change	95 vs. 94 % Chang
Carbon dioxide emissions (KT)	9,708	12,766	12,756	3,048	31.40%	-10	-0.08%
Production (m3)	11,951	17,865	18,825	6,874	57.52%	960	5.37%

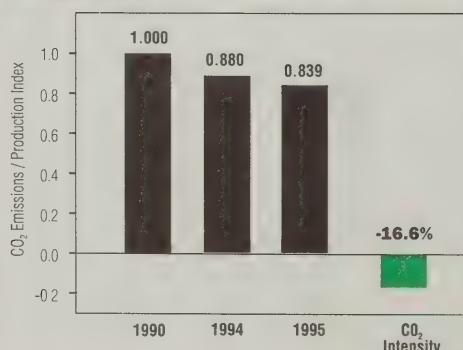
Physical Carbon dioxide Intensity

The carbon dioxide intensity of the oil sands sector improved by 16.6 per cent in 1995 compared with 1990. See Figure 137.

Oil Sands Carbon dioxide / Production Index and Carbon Dioxide Intensity: 1990 to 1995

FIGURE

137



Avoided Carbon dioxide Emissions

The oil sands sector avoided over 2,500 kilotonnes of carbon dioxide emissions in 1995. See Figure 138.

FIGURE

138

Oil Sands 1995 Avoided Carbon dioxide Emissions

	1990	1995	90 vs. 95 % Change
Carbon dioxide emissions (KT)	9,708	12,756	31.4%
Production (m3)	11,951	18,825	57.5%
CO ₂ / Production (KT/m3)	0.812	0.678	
Index	1	0.834	
	1990	1995	
Carbon dioxide Emissions (KT)**	9,708	15,292	
Annual Avoided CO ₂ Emissions (KT)	0	-2,536	

** Based on 1990 CO₂ Intensity

Refined Petroleum Products - SIC 3611

Absolute Carbon dioxide Emissions

As Figure 139 shows, carbon dioxide emissions of the refined petroleum products sector decreased by 10.5 per cent between 1990 and 1995, while production decreased only 1.0 per cent.

Between 1994 and 1995, carbon dioxide emissions decreased by 2.0 per cent alone, while production increased slightly.

FIGURE

139

Refineries	1990	1994	1995	95 vs. 90 KT Change	95 vs. 90 % Change	95 vs. 94 KT Change	95 vs. 94 % Change
Carbon dioxide emissions (KT)	16,494	15,072	14,766	-1,728	-10.48%	-306	-2.03%
Production (m3)	95,393	94,275	94,406	-987	-1.03%	131	0.14%

The sector's carbon dioxide emissions were reduced by 10,000 tonnes at one refinery alone as a result of upgrading a process unit to improve heat integration. This project cost \$1.4 million, saved \$500,000 per year in fuel and improved unit efficiency by 10 per cent.

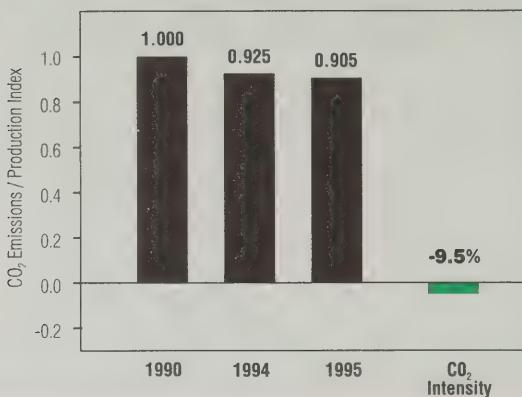
At another location, savings of \$150,000 per year were realized by installing a variable speed drive on a boiler forced draft fan - this was part of Ontario Hydro's Energy Saver Program and led to a carbon dioxide emission reduction of 3,000 tonnes.

Physical Carbon dioxide Intensity

As a result, the carbon dioxide intensity of the refined petroleum products sector improved by 9.5 per cent in 1995 compared with 1990. See Figure 140.

FIGURE

140

Refined Petroleum Products Carbon dioxide / Production Index and Carbon Dioxide Intensity; 1990 to 1995


Avoided Carbon dioxide Emissions

The petroleum refining sector avoided over 1,500 kilotonnes of carbon dioxide emissions in 1995. See Figure 141.

FIGURE

141

Refined Petroleum Products 1995 Avoided Carbon dioxide Emissions

	1990	1995	90 vs. 95 % Change
Carbon dioxide emissions (KT)	16,494	14,766	-10.5%
Production (m ³)	95,393	94,406	-1.0%
CO ₂ / Production (KT/m ³)	0.173	0.156	
Index	1	0.905	
	1990	1995	
Carbon dioxide emissions (KT)	16,494	16,323	
Avoided CO ₂ Emissions (KT)	0	-1,557	

** Based on 1990 CO₂ Intensity

Steel Carbon dioxide Emissions - SIC 2910

Considerable progress has been made by the steel sector since 1985 in reducing carbon dioxide emissions.

In 1990, a five month strike at two large steel companies caused an unusual decrease in steel shipments, energy consumption and related carbon dioxide emissions, making 1990 a poor baseline year. The steel sector's 1990 carbon dioxide emissions have been increased by 3.14 million tonnes, or 22 per cent, to adjust for this anomaly.

Absolute Carbon dioxide Emissions

Figure 142 shows that steel related carbon dioxide emissions decreased by 13.1 per cent between 1990 and 1995, while production increased over 15 per cent.

FIGURE

142

	1990*	1991	1992	1993	1994	1995	90 vs. 95 Change
Carbon dioxide emissions (tonnes 000)	17,374	15,464	16,022	15,721	14,638	15,104	-13.1%
Steel Shipments (tonnes 000)	12,603	11,241	12,207	13,313	13,406	13,335	15.3%

* 1990 carbon dioxide emissions and steel shipments have been adjusted.

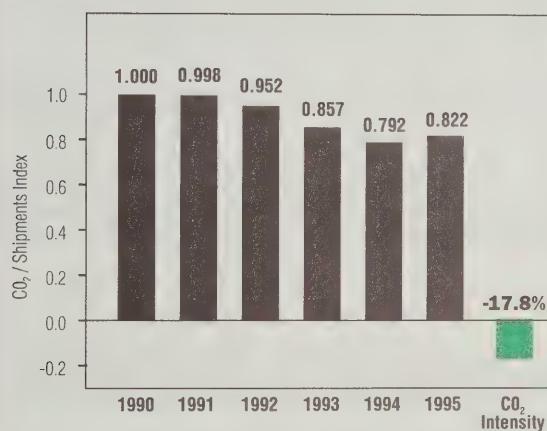
Physical Carbon dioxide Intensity

As a result, the sector's carbon dioxide intensity improved by 17.8 per cent in 1995 compared with 1990. See Figure 143.

FIGURE

143

Steel Carbon Dioxide Emissions / Shipments Index and CO₂ Intensity



Avoided Carbon dioxide Emissions

In 1995, the steel industry avoided emitting over 3.2 million tonnes of carbon dioxide relative to its 1990 levels, based on its 1990 adjusted emissions and steel shipments. See Figures 144 and 145.

FIGURE

144

Steel Sector's Avoided 1995 Carbon dioxide Emissions

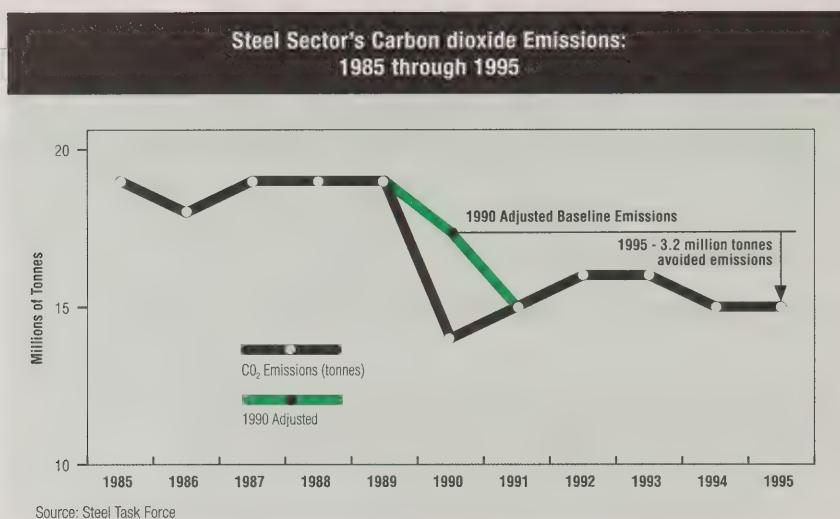
Actual Emissions	1990	1995	90 vs. 95 % Change
Carbon dioxide emissions (KT)	17,374	15,104	-13.1%
Steel Shipments (KT)*	12,603	13,335	5.8%
CO ₂ / Shipments	1.379	1.133	-17.8%
CO ₂ / Shipments Index	1	0.822	
Avoided Carbon dioxide Emissions	1990	1995	
Carbon dioxide Emissions (KT)**	17,374	18,383	
Avoided CO ₂ Emissions (KT)	0	-3,278	

* adjusted 1990 shipments

** Based on 1990 CO₂ intensity

FIGURE

145



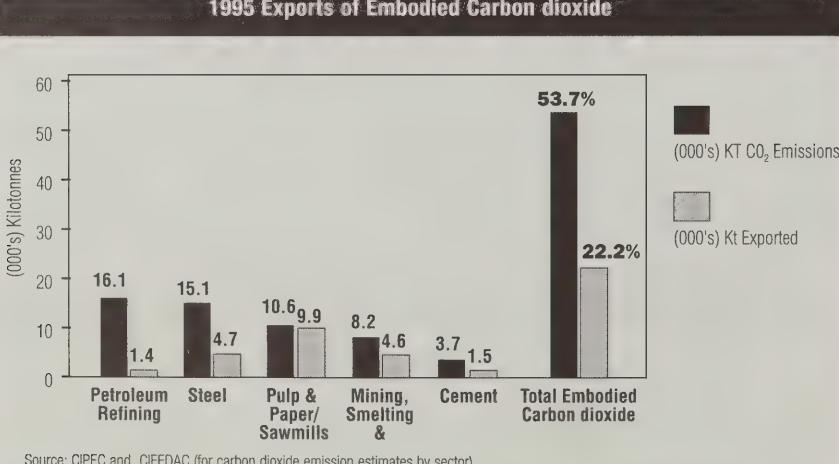
Five industrial sectors - petroleum refining, steel, pulp and paper / sawmills, cement, mining and smelting and refining - combined produced about 54 per cent of the total manufacturing and mining carbon dioxide emissions.

These sectors exported, in total, 41 per cent of their output, which represents 22,200 kilotonnes of embodied carbon dioxide. Put another way, 23 per cent of total manufacturing and mining carbon dioxide emissions in 1995 were contained in the exports of these five industrial sectors.

For purposes of this report, embodied carbon dioxide emissions is defined as emissions which are related to the energy used in a product's final production.

FIGURE

146



A strong case can be made that, for purposes international negotiations to establish post-2000 GHG reduction targets and timetables, exports of embodied carbon dioxide should be credited to the account of the importing country and included in the process of determining its overall GHG emissions.

If such a credit / allocation system does not develop internationally, countries, like Canada, which have highly energy efficient industrial processes may be penalized. The result could be more, not less GHG being emitted throughout the world to produce the same volume of goods.

The Climate Change Voluntary Challenge and Registry (VCR) Program

The Voluntary Challenge and Registry (VCR), an initiative of Canada's National Action Program on Climate Change (NAPCC), was introduced in 1995.

The VCR invites companies and organizations to commit to:

- reduce GHG emissions;
- develop reduction targets with supporting action plans; and,
- report on progress.

A public registry has been developed to document the commitments, action plans, progress reports and achievements of all participants.

Industrial Energy Innovators

In that most manufacturing and mining companies are engaged in industrial energy efficiency programs and initiatives, and since the resulting reduction in energy use per unit of production causes reductions in carbon dioxide emissions, the most important GHG, because it accounts for 79 per cent of all emissions, CIPEC and NRCan developed the Industrial Energy Innovator Initiative (IEI).

Under this initiative, manufacturing and mining companies are invited to show support for their industry sector's energy efficiency target by voluntarily committing to:

- undertake efforts to improve their energy efficiency;
- develop corresponding targets along with supporting action plans; and,
- report on progress describing energy efficiency improvement projects

Unless otherwise requested, IEIs are automatically registered in the VCR and receive an IEI plaque signed by the Chairman of CIPEC and the Minister of NRCan in recognition of their undertaking.

VCR Registrations

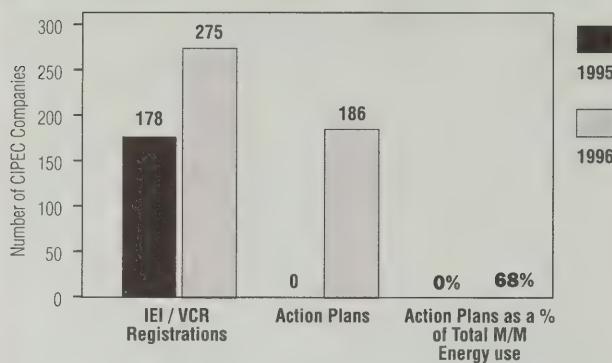
As at December 27, 1996, 275 manufacturing and mining companies, representing more than 65 per cent of total manufacturing and mining energy use, have agreed to implement energy efficiency measures as IEIs and / or through the VCR. This represents a 55 per cent increase over 1995.

Of these 275 companies, 236, or 86 per cent, registered with the VCR as Industrial Energy Innovators. See Figure 147.

VCR Action Plans

186 manufacturing and mining companies, or 68 per cent of those which have registered with the VCR, submitted action plans to the VCR in 1996. These companies represent over 50 per cent of total manufacturing and mining energy use. Of these 186 companies, 169, or 91 per cent, were Industrial Energy Innovators.

FIGURE

147**Manufacturing and Mining VCR Registrations
and Action Plans: 1995 vs 1996**

CIPEC Services To Industry

CIPEC provides a variety of services to industry, including:

- the most accurate and reliable baseline data collection and tracking system currently available;
- helping industry sectors establish voluntary energy intensity improvement targets and tracking progress towards those goals;
- identifying opportunities for technology transfer;
- the Industrial Energy Innovator initiative;
- energy efficiency improvement training through the Canadian Institute for Energy Training (CIET);
- energy management personnel to companies through the On-Site program; On-Site is an initiative supported by the federal government whereby an unemployed professional, with appropriate background and experience, is chosen by a company to go "on staff but not on payroll" for a six month in-house energy management training experience. During this period, he/she receives employment insurance.
- a Guide on Energy Management for industry;
- providing industrial energy news and information in "Plant" newspaper;
- regular information exchange with governments, utilities and others on industrial energy initiatives, thereby ensuring the energy use reduction activities of these organizations are better coordinated.

Benefits to Companies Participating in CIPEC

Industry benefits from CIPEC as a result of:

- a coordinated, voluntary industry response to government priorities, such as the Voluntary Challenge and Registry;
- a single focus for industry action rather than a company having to appoint representatives to a multitude of association energy committees all trying to attain the same goal;
- ensuring accurate, credible and cost-effective data gathering on behalf of industrial sectors;
- providing credible analysis of data through CIEEDAC;
- annual recognition of industry achievement through Industrial Energy Innovator awards and the CIPEC annual report.

Benefits to Industry Associations Participating in CIPEC

Industry associations benefit from participation in CIPEC because:

- it complements industry association mandates to safeguard the interests of their members;
- it avoids needless duplication of effort, in an era of financial restraint;
- an industry association can appoint a sector representative to the CIPEC Policy Board and Task Force Council, thereby ensuring its sector's perspectives are taken into account; and,
- it ensures that the accurate measurement of sector and overall industrial progress is achieved in a cost-effective way.

Group ISO 9000 Program with Energy Performance Measures

To assist small to medium sized manufacturers (SME's) become more energy efficient, CIPEC in cooperation with Ontario Hydro, Consumers Gas, Union Gas, Centra Gas, the Ontario Ministry of Environment and Energy and NRCan have initiated a unique program to identify and then measure physical energy intensity performance measures.

SME's use about 8 per cent of the energy consumed by Canadian industry, or about 2 per cent of Canada's total annual energy consumption.

Considering that there are thousands of SME's in Canada, the amount of energy any one company uses is small. But energy costs money and anything which can be done to reduce the amount used per unit of production improves the corporate bottom line.

As well, energy related greenhouse gas emissions, such as carbon dioxide, are of increasing concern to governments, so every effort is being taken to reduce the amount of energy consumed by industry, regardless of size.

Energy, as traditionally defined, is not usually a major operating cost for most SME's. As a result, energy efficiency improvement projects are not usually assigned high priority.

The results of a 1996 survey by the Alliance of Manufacturers & Exporters Canada among 500 firms indicates that:

- 69 per cent of the responding firms, with sales of less than \$10 million, did not have an energy efficiency improvement program in place;
- 42 per cent of responding firms, with annual sales in excess of \$100 million, did not have such a program in place; and that,
- 63 per cent of responding firms, regardless of size, did not have such a program in place.

For most companies, it is difficult to measure accurately all of the primary and secondary energy, water and other resources consumed in the manufacturing process.

With these considerations in mind, CIPEC initiated a pilot project which links implementation of ISO 9000 quality assurance standards to physical energy intensity performance measures.

The objective is to enable participating companies to identify ways to reduce the amount of energy and other scarce resources used to produce a unit of production and, thereby, to enhance their competitive position. As well, each company achieves compliance with an ISO 9000 standard.

While costs related to lack of quality are usually thought to be 3 to 5 per cent of operating expenses, a comprehensive economics of quality approach is able to show that real energy costs are usually significantly higher.

ISO 9000 provides a framework within which key processes in an organization can be identified and documented.

Organizations employing this approach can justify energy efficiency improvement investments since paybacks are clearly identified at both an operating and strategic level.

Energy is broadly defined to include natural gas, electricity, oil, energy embodied in materials used in the manufacturing process, and water (both process and non-process).

Results from this initiative should be available in 1998.

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The CIPEC Industrial Sectors - Standard Industrial Classification (SIC) Codes

The CIPEC universe of manufacturing and mining sectors is slightly smaller than the Statistics Canada grouping of industrial sectors. Figure 148 below lists the sectors along with the Standard Industrial Classification (SIC) codes which are included in the CIPEC universe.

**FIGURE
148**

Sector	SIC Code	Sector	SIC Code
Mining	06	Furniture and Fixture Industries	26
Non-Conventional Crude Oil Industry	0712	Paper and Allied Products	27
Food Industries	10	Printing, Publishing and Allied Industries	28
Beverage Products	11	Primary Metal Industries	29
Tobacco Products	12	Fabricated Metal Products (except machinery and transportation equipment)	30
Rubber Products	15	Machinery (except electrical)	31A
Plastic Products	16	Transportation Equipment	32
Leather and Allied Products	17	Electrical and Electronic Products	33
Primary Textiles	18	Industrial Minerals	35
Textiles Products	19	Petroleum Refining	36
Clothing Industries	24	Chemical and Chemical Products	37
Wood Industries	25	Other Manufacturing Industries	39

The manufacturing and mining sectors not included in the CIPEC universe are shown in Figure 149.

**FIGURE
149**

Sector	SIC Code	Sector	SIC Code
Fishing and Trapping	03	Mineral Extraction Services	09
Logging	04	Coal mining	063
Forestry Services	05		
Conventional crude oil and natural gas production	071	Construction	40
Quarry & Sand Pits	08		

For 1995, energy consumption data for the period 1990 through 1995 was available for about 94 per cent of total manufacturing and mining energy consumption.

StatsCan give a confidence level of more than 90 per cent on the data collected by its ICE survey and projections of representative samples.

CIPEC 3: The Path Forward Plan: 1997 - 1998

Objective

This document outlines a one-year transition plan for the delivery of the Canadian Industry Program for Energy Conservation (CIPEC), with a provision through to 2000.

CIPEC 3 Mandate

CIPEC 3 will provide a focus on voluntary energy efficiency commitments and actions by the manufacturing and mining sector as the primary means of helping Canada meet its international climate change commitments through the Climate Change Voluntary Challenge and Registry Program (VCR) as well as foster competitiveness and economic development.

Background

CIPEC is a key element of Natural Resources Canada's Industrial Energy Efficiency Initiative (IEE). The IEE provides a focal point for joint voluntary industry / government alliances to increase energy efficiency, limit emissions of energy-related greenhouse gas emissions and increase economic competitiveness. Key program outputs include energy efficiency improvement targets and action plans to achieve these targets at a sector and sub-sector level. Through a network of sector task forces supported by related vertical trade associations, CIPEC is a means of coordinating target and action plan development and implementation. CIPEC also includes the tracking and reporting of energy efficiency improvements and related emissions reductions as well as access to services designed to reshape and / or reduce marketplace barriers to the implementation of energy efficiency practices and programs within manufacturing and mining companies.

Between 1975 and 1990, the CIPEC program was delivered by Energy, Mines and Resources Canada (CIPEC 1). From 1992 to 1997, CIPEC (CIPEC 2) has been delivered through a Secretariat operating under the auspices of the Alliance of Manufacturers & Exporters Canada, formerly known as the Canadian Manufacturers' Association. An agreement between Natural Resources Canada and the Alliance provides for an annual contribution of \$500,000 for the operation of the Secretariat. The Agreement ceases on March 31, 1997.

Both Natural Resources Canada and the various associations participating in CIPEC have decided that a refocusing of the program to integrate with and support the VCR as well as adjust to a more active participation and commitment by the associations is required. This is seen as a more effective means of achieving key result areas including identifying enhanced targets and, in response to the needs of the various sector task forces, the development of services such as benchmarking, best practices identification, technical information, training and program and project management techniques for adjusting priorities to the implementation of energy efficiency in the manufacturing and mining sectors. This new industry / government cooperative effort will be known as CIPEC 3. The program will be delivered through Natural Resources Canada using a combination of in-house and external resources.

Linkages to CIPEC 2

The CIPEC 2 program achieved the following:

- obtained formal Canadian industry commitment to using voluntary energy efficiency measures to achieve industry carbon dioxide stabilization at 1990 levels by the year 2000, on the assumption of an annual industrial growth of no more than 2.0% (the first sector to make such a commitment);
- established an industrial energy efficiency network at the sector level that includes 33 Associations and / or industry groups that represent over 90 per cent of secondary industrial demand and more than 3,000 companies;

- enlisted individual commitments to set targets, develop action plans and implement energy efficiency improvement projects from companies representing approximately 75% of industrial energy use; and
- developed a world class industrial energy efficiency tracking and reporting system based on an energy / unit of output basis. The outputs of the system are directly linked to Canada's tracking of energy-related carbon dioxide emissions from the manufacturing and mining sectors.

Functions of CIPEC 3

The CIPEC 3 program will build upon the accomplishments of CIPEC 2 and will continue to:

- coordinate the establishment of both consolidated energy efficiency improvement commitments for Canada's manufacturing and mining sectors as well as individual sub-sector-level energy efficiency improvement targets and action plans;
- provide a consolidated report of the accomplishments of manufacturing and mining in terms of energy efficiency and emissions improvements as well as reporting annually on sub-sector performance in the attainment of individual targets;
- encourage the implementation of action plans at the sub-sector level for target achievement;
- provide a catalyst for promoting synergy between the sectors through the Sector Task Forces;
- encourage the enlistment of individual company commitments; and
- provide a framework for NRCan and other jurisdictions to identify and respond to sector task force needs and requirements in terms of adjusting and influencing priorities to the implementation and adoption of energy efficiency programs and practices by manufacturing and mining companies.

Structure

CIPEC 3 will be a dedicated, pro-active resource, focused on the achievement of specific results as opposed to being a permanent stand-alone organization. It will be a network of vertical associations, voluntary task forces and companies which achieves synergy through a Task Force Council of Sector Task Force Chairs and which looks to the manufacturing and mining executives of the Climate Change Voluntary Challenge and Registry Program (VCR) for leadership and direction.

CIPEC 3 will not duplicate the VCR. Rather, it will complement and enhance the goals of the VCR within the manufacturing and mining sectors.

CIPEC 3 will be resourced through NRCan's Industrial Energy Efficiency Initiative (direct financial and in-kind resources), applicable vertical associations (in-kind resources), participating companies (in-kind resources) and utilities and other jurisdictions sponsoring industrial energy efficiency programs (direct financial and in-kind resources). NRCan will be responsible for program management as well as being the principal funder of CIPEC 3.

CIPEC 3 Organization

Sector Task Forces

At the centre of CIPEC 3, a network of sector task forces will continue to define energy efficiency opportunities, set targets and implement strategies to achieve them. The Task Forces will be strongly supported by their respective association(s) and member companies particularly in the execution of action plans aimed at the agreed targets and the annual reporting of progress to the public.

The Task Forces will revisit their sector targets as well as develop and implement action plans focusing on strong commitments and results. This activity will allow them to define the amount of NRCan support which is required. Other activities will include holding regular meetings, preparing sector reports with

success stories, developing plans for promotion and recruitment, and actively providing advice and knowledge to existing Industrial Energy Innovators as well as urging them to carry out Energy Efficiency programs.

Task Force Council

The leaders of the task forces will continue to come together as a Task Force Council to ensure consistency in approach, integration where synergy exists, and the sharing of best practices. The Chairperson will also participate in the CIPEC 3 Executive Council and be in a position to obtain strong support from the Manufacturing and Mining CEOs and channel their enthusiasm to the task forces.

The Task Force Council will work with Natural Resources Canada to define a program work plan and budget needs as well as the nature and extent of task force support needed from NRCan and other potential allies. Among other projects, the Council will ensure that there are ongoing efforts to improve data accuracy and reporting as well as the efficiency of the data collection and reporting system.

Executive Council

The Executive Council will continue to provide top down leadership within the manufacturing and mining sector at the association, task force and company levels as well as providing a focal point for Ministerial contact with the sector and for the key themes and messages of the CIPEC Annual Report.

Associations

Associations will be responsible for living up to the terms of their CIPEC 2 Letters of Cooperation by championing the voluntary approach within their membership. They will also take the lead on task force establishment and operations and will be responsible for preparing their sector's submission to the CIPEC Annual Report. They will work with their respective Task Forces to improve data accuracy and reporting, as well as the efficiency of the data collection and reporting system. They will also be responsible for identifying new opportunities and commitments for participating companies.

Natural Resources Canada

NRCan's close coordination with the Task Force Council and its Chair will be responsible for the management of CIPEC 3. As a minimum, this will require responsibility for coordination, logistics and program operations as well as providing resources to help the task forces in the development of targets and action plans for realizing the targets. Other responsibilities will include program promotion, recruitment and data tracking and reporting.

Support will also be available from NRCan in the form of training programs, workshops, benchmarking data and dedicated resources. This support will be available to companies, associations, and Sector Task Forces based on their needs.

Transition Plan (April 1997 to March 1, 1998)

Funding

NRCan will fund ongoing activities associated with the operations of the Executive Council, the Task Force Council and, as required, the individual Task Forces. The funding mechanism will be either direct contracts with Consultants or via Contribution Agreements with Associations for specific deliverables. Associations are expected to provide various types of "in-kind" support to the Task Forces.

Elements of Transition

1998 - 2000

During 1997/98, an operations plan to the year 2000 will be developed by the Task Force Council. This will be put in place effective April 1, 1998.

CIPEC 3: Data Collection and Analysis Issues

Although a great deal of progress has been made over the past five years to improve the collection and analysis of manufacturing and mining energy use, energy intensity and related carbon dioxide emissions, there are still a number of issues remaining. Below are some of the issues which CIPEC 3 should address.

I Energy

1. Assumption

CIPEC's primary performance measure is energy use per unit of production - a physical energy intensity measure.

Given this, the following are the principal problems which still exist with the manufacturing and mining data collection and analysis system.

2. Energy Use Numbers

1. Eight sector Task Forces / Associations disagree with the StatsCan data for their sectors.

- brewery
- cement
- dairy
- mining sector (use of the survey of mines data rather than ASM)
- petroleum refining (high vs. low heat values and absolute units)
- steel
- textiles
- wood industry

2. The smelting and refining sector data, SIC 295, has some anomalies when aluminum energy use is extracted to create SIC 2959.

3. The latest data for most manufacturing and mining SIC sectors is for 1994. Is their use of energy sufficiently great to make it worthwhile to capture some of these sectors in the ICE survey?

3. Physical Units of Production

1. There are 13 industry sectors for which, at present, there are no physical units of production. As a result, it is not possible to calculate physical energy intensity for those sectors.

Non Ferrous Smelting and Refining (less aluminum) have no GDP numbers or physical units of production.

2. There are at least 46 industrial sectors for which neither physical units of production nor GDP data are collected by StatsCan.

4. Economic (GDP) Data

1. There are 12 sectors for which there are no economic (GDP) data.

2. As well, manufacturing and mining GDP data do not include oil sands, so an overall manufacturing and mining economic energy intensity calculation cannot be made.

5. Sector Task Force Issues

1. Non-metal mining - does the Mining Task Force wish to assume this responsibility or should a separate Task Force be set up?

2. Chemicals - an active CIPEC Sector Task Force needs to be established.

3. Scope of Task Force responsibilities - now that more detailed data on an SIC basis is available, the scope of responsibility of the following Task Forces should be confirmed:

- Food Processing
 - Meat & Poultry
 - Fruit & Vegetables
 - Bakery Products
 - Other Food Products
- Beverage
 - Soft Drink
 - Distillery Products
- Foundries
 - Iron Foundries
 - Ferro Alloys
 - Steel Foundries
 - Aluminum Rolling, Casting & Extruding
 - Copper Alloy, Rolling, Casting & Extruding
 - Other Rolled, Cast and Extruded Non-Ferrous Metal Products
- Non-Metal Mining
 - Asbestos
 - Peat
 - Gypsum
 - Other Non-Metal Mines
- Transportation
 - Motor Vehicles
 - Motor Vehicles Parts and Accessories
 - Aircraft & Aircraft Parts
 - Railroad Rolling Stock
 - Shipbuilding and Repair
 - Boatbuilding & Repair
 - Truck and Bus Trailer
 - Other Transportation

6. Higher vs. Lower Heating Values

StatsCan calculates higher heating values (HHV) for all manufacturing and mining sectors. However, the petroleum refining and cement sectors use lower heating values (LHV).

The Petroleum refining sector uses LHV's because this is the measure which the Solomon international survey uses. The cement sector uses LHV's because this is the measure used by European cement companies. HHV's are used by US cement companies, however.

In Europe there is no standard policy. Each country and industry sector appears to use whatever suits its purposes.

The International Energy Agency prefers higher heating values. Regardless, there is no international standard and, as a result, comparisons of one country's industrial energy use against another can be meaningless.

Efforts should be undertaken to resolve this issue.

II. Carbon dioxide Emissions

1. Assumption

Manufacturing and mining will increasingly be measured in terms of its greenhouse gas (carbon dioxide) emissions, with physical energy intensity being an intermediate measure.

2. Greenhouse Gas Data

Environment Canada should:

- provide carbon dioxide emission data on the same SIC code basis as energy use data is prepared
- reconcile the 1990 carbon dioxide baseline emissions for mining

Associations

Each association / sector should designate a person who is responsible for reviewing and agreeing / disagreeing / or resolving differences between that sector's own industry data and the energy use, production / GDP and carbon dioxide emissions data developed by StatsCan, CIEEDAC or Environment Canada for that sector.

APPENDIX 4

Collection and Analysis of Energy and Carbon dioxide Data

StatsCan collects a variety of energy consumption data. The results of its surveys are analyzed by:

- Simon Fraser University's Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) which compares year to year industrial energy consumption data, and, where possible, physical and economic units of production for each manufacturing and mining sector;
- CIPEC which establishes, where possible, the physical and / or economic energy intensity of each manufacturing and mining sector. This data is provided to Sector Task Forces and associated Trade Associations in order for them to monitor and report annually on progress in relation to their established targets;
- Environment Canada which builds the National Inventory of Greenhouse Gas Emissions; and,
- the Climate Change Voluntary Challenge and Registry (VCR) when it records individual company action plans. See Appendix 6.

CIPEC, over the past five years, has worked with industry associations, StatsCan, NRCan, and CIEEDAC to build the database and monitor industrial energy use since the 1990 base year. This has resulted in a mutually agreed upon data collection and analysis procedure.

StatsCan has historically recorded the consumption of energy from two separate sources. These are:

- the ICE survey, which contributes information published in the QRESID; and
- the Consumption of Purchased Fuels and Electricity (CPFE) report, which forms part of the Annual Survey of Manufacturers (ASM).

Industry's energy data is collected and analyzed by three principal entities:

- Statistics Canada through its ASM and the ICE Survey;
- CIEEDAC which compares year to year , sector and total, industrial energy consumption data, and develops energy intensity data; and
- CIPEC Sector Task Forces and supporting trade associations, which review and verify the validity of the industrial energy use data and monitor and explain progress in relation to established targets.

Since each report uses different criteria to measure energy consumption in different sectors, neither is suitable alone as a monitoring device for energy consumption in specific industries.

To increase the quality, timeliness, reliability and suitability of the data reflecting energy consumption in specific industries, changes were made to StatsCan's ICE survey in 1994 and in 1995.

Environment Canada uses data collected by StatsCan's QRESID but does not use ASM data. This latter survey provides data on a subsector basis, the QRESID does not.

Expanded ICE Survey

The expanded 1995 ICE Survey has enabled Statistics Canada, Natural Resources Canada and CIEEDAC to refine the data for manufacturing and mining for the period 1990 through 1994.

As well, subsequent Statistics Canada clarification or product definition has required a restatement of the energy use and output data for a number of manufacturing and mining sectors shown in CIPEC's 1994 / 1995 Annual Report.

For example, the ICE survey identified:

- a number of anomalies in certain fuels as reported in the Annual Survey of Manufacturers (ASM) and in the 1994 ICE survey;
- the need for a number of energy co-efficients to be changed to better reflect those used by Statistics Canada in various years, especially in coal and natural gas;
- changes needed in methodology used to calculate the energy contained in coke oven gas and by-products of the petroleum refining process;
- that some respondents had submitted feedstock as fuels in a number of sectors including chemicals, resins and plastics, fertilizers, petroleum products and iron and steel;
- some data used to reflect biomass consumption in the pulp and paper and wood products industry may not have been obtained from reliable sources and were excluded.

Finally, no specific energy consumption in physical units was collected in 1990 in the ASM and the values used in the 1994 - 1995 Annual Report had to be calculated from energy expenditures made in that year. A recalculation of energy consumption data for 1990, based on better provincial analyses, has improved the 1990 data set.

It is possible that additional refinements to manufacturing and mining energy use data will be made in future years, as we gain experience with the ICE survey. This could result in a further restatement of the data contained in this Annual Report.

Collection and Analysis of Carbon dioxide Data

Carbon dioxide Emissions Data Collection and Analysis

Environment Canada is responsible for calculating the associated carbon dioxide and other energy related greenhouse gas emission estimates for the CIPEC defined universe as a subset of the total national greenhouse gas emissions inventory.

Unfortunately, an accurate carbon dioxide and other greenhouse gas baseline data system is not yet available. Neither is there agreement on the assumptions for forecasting future industrial energy use.

StatsCan and Environment Canada have signed a Memorandum of Understanding on Data Sharing, providing Environment Canada with full access to all energy data now gathered by StatsCan starting in calendar year 1996 and beyond, thus enabling further disaggregation of emissions.

Approximately 2,100 establishments, representing over 90 per cent of total industrial energy consumption, now report to StatsCan on their energy use via the ICE Survey. This information is also used to calculate the amount of carbon dioxide emissions which industry produces from stationary sources.

Industrial Consumption of Energy (ICE) Survey 1996

Set out below is an outline of the kind of data collected by the ICE survey.

Purpose of Survey

The purpose of this survey is to obtain information on the supply of, and demand for, energy in Canada. This information serves as an important indicator of Canadian economic performance, is used by all levels of government in establishing informed policies in the energy area. In the case of public utilities, it is used by governmental agencies to fulfill their regulatory responsibilities. The private sector also uses this information in the corporate decision-making process.

Confidentiality

StatsCan is prohibited by law from publishing any statistic which would provide information obtained from this survey that relates to any identifiable business, without the previous written consent of that business. The data reported will be treated in strict confidence, used for statistical purposes and published in aggregate form only. The confidentiality provisions of the Statistics Act are not affected by either the Access to Information Act or any other legislation. An exception to this general rule of confidentiality is the disclosure, at the discretion of the Chief Statistician, of identifiable information relating to public utilities. This includes enterprises supplying petroleum products by pipeline, and enterprises supplying transmitting or distributing gas, electricity or steam.

Data Sharing Agreements

To reduce the response burden and to ensure uniform statistics, StatsCan has entered into agreements with various agencies and government departments for the joint collection and sharing of data. The information provided in this survey pertaining to individual respondents cannot be divulged, in any way, by the parties with which StatsCan has agreements. Under Section 12 of the Statistics Act, agreements exist with Natural Resources Canada and Environment Canada. Section 12 agreements shall not apply to your return if an officer of your company objects in writing to the Chief Statistician and mails the letter to the Industry Division of StatsCan together with the completed questionnaire.

Completion and Return

Complete and return within 30 days after the end of the reporting period. If you require assistance in the completion of the questionnaire, contact the Energy Section at (613) 951-3522 or by fax (613) 951-3522.

Industrial Consumption of Energy Survey Guide

I. Reporting Instructions

Please report all energy purchased and/or consumed by the industrial establishment. Exclude energy used by contractors and suppliers, common carriers and suppliers. Round all data to the nearest whole number.

II. Definitions

Please report your energy use according to the following definitions:

(a) Reporting Categories

Energy Content - The factor which converts the energy form from its natural unit to a joule scale on a higher heating value basis.

Inventory - Report inventories at both the start and end of the reference period for coal, coke and heavy fuel oil.

Received During Period - Energy purchased or received from outside the plant location. Include energy received from an affiliate company.

Produced Internally - Energy produced by the establishment for its own consumption or for resale.

Sales, Adjustments, Losses, etc. - Sales of the energy form to a user outside the plant. The user might be an affiliate or a third party. Adjustments include cyclical billing and timing differences, losses in transportation and metering differences.

Consumed to Produce Electricity or to Produce Steam for Sale - Energy consumed in the production of electricity for own use or sold or energy used in the production of steam which is then sold to a user outside the plant location.

Consumed as Fuel - The quantity of energy consumed in the production process of the plant which includes heating in premises.

Consumed for Non-Fuel Use - Energy consumed for uses other than as fuel in the plant production process. This includes products used as petro-chemical feedstock, anodes/cathodes, greases, lubricants, etc.

If fuel is used to generate steam for sale, report Steam Sales in gigajoules on the front part of the questionnaire.

(b) Energy Forms

Electricity - A form of energy emanating from electric charges at rest or in movement. The figure reported for Electricity in the box Consumed as fuel must equal the sum in the boxes of Received during period and Produced internally (if any).

Natural Gas - A mixture of hydrocarbons (principally methane) and small quantities of various hydrocarbons existing in the gaseous phase or in solution with crude oil in underground reservoirs. Report in thousands of cubic metres in the gaseous state.

Propane - A normally gaseous straight-chain hydrocarbon extracted from natural gas or refinery gas streams. It can also take a liquid form.

Diesel - All grades of distillate fuel used for diesel engines including low sulphur content (lower than 0.05%). Does not include diesel used for transportation off the plant site.

Other Middle Distillates - Includes light fuel oil (nos. 1,2 and 3), kerosene, mineral lamp oil, furnace fuel oil, gas oils and light industrial fuel.

Heavy Fuel Oil - All grades of residual type fuels including low sulphur. Usually used for steam and electric power generation and diesel motors. Includes fuel oils nos. 4, 5, and 6.

Steam - A gas resulting from the vaporization of a liquid or the sublimation of a solid, generated by condensing turbines. To avoid double-counting, internally produced steam consumed on-site is not to be reported in the Consumed as fuel column.

Wood - Wood and wood energy used as fuel, including round wood (cord wood), lignin, wood scraps from furniture and window frame manufacturing, wood chips, bark, sawdust, forest residues, charcoal and pulp waste.

Spent Pulping Liquor - A by-product of the paper making process containing carbohydrate and lignin decomposition products.

Refuse - Solid or liquid waste materials used as a combustible energy source. This would include the burning of wastepaper, packing materials, garbage, bagasse, sewerage gas, biogas, tires, waste oil, contaminates and other industrial, agricultural and urban refuse often used to generate electricity.

Bituminous Coal - A dense, black coal, often with well-defined bands of bright and dull material with a moisture content usually less than 20 per cent. Often referred to as soft coal. Used primarily for generating electricity, making coke and space heating.

Subbituminous Coal - A black coal used primarily for thermal generation with moisture content between 15 and 30 per cent.

Lignite - A brownish-black coal of low rank containing 30 to 40 per cent moisture and volatile matter (also known as brown coal in which the texture of the original wood is distinct). Used almost exclusively for electric power generation.

Anthracite - A hard, black, lustrous coal containing a high percentage of fixed carbon, a low percentage of volatile matter and little moisture content. Often referred to as hard coal and burns with a nearly smokeless flame.

Coal Coke - A hard, porous product made from baking bituminous coal in ovens at high temperatures. Often used as a fuel and a reducing agent in smelting iron ore in a blast furnace.

Petroleum Coke - A residue that is the final product in the condensation process in cracking. Includes pitch.

Other - Any energy form consumed not otherwise identified in the questionnaire. Specify in the spaces provided.

Of Special Interest to Other Primary Steel Industries

Coke Oven Gas - The difference between the thermal value of coal charged to coke ovens less the thermal value of the resultant coke production, with an allowance for heating and losses. Report in thousands of cubic metres in the gaseous state.

Coal Tar - Organic material separated from coke oven gas evolved during coking operations. A black, viscous liquid including pyridine, tar acids, naphthalene, creosote oil and coal pitch.

Light Oil - Condensable products (primarily benzene, toluene, xylene, and solvent naphtha) obtained during distillation of the coke oven gas, following removal of the coal tar.

Of Special Interest to Petroleum Products Industries

Petroleum Coke - Marketable grades of coke produced in delayed or fluid cokers that may be recovered as relatively pure carbon. May be sold as is or is further purified by calcining.

Coke on Catalytic Cracking Catalyst - Coke produced from the refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules.

Refinery Gas - The remaining unseparated gaseous fractions produced in refinery distillation or cracking processes, after marketable products have been extracted, usually consumed as refinery fuel. It is also known as still gas. Report in thousands of cubic metres in the gaseous state.

Please ensure that you include producer consumption when reporting your establishment's activities.

Steam Sales	gigajoules
Residential (include apartment buildings)	1.1
Agriculture	1.2
Pulp and paper	1.3
Chemicals	1.4
Other Manufacturing	1.5
Public Administration	1.6
Commercial	1.7
Total	1.10

Conversion Factors

Industrial Consumption of Energy Survey

Volume

(natural gas, propane, oil, distillates)

From	To cubic metre (multiply by)
U. S. gallon	0.0038
Imperial gallon	0.0045
Barrel	0.1590
Cubic foot	0.0283
100 Cubic feet (Ccf)	2.8328
Litre	0.001

Mass

(coal, coke, wood, spent pulping liquor, refuse)

From	To metric tonne (multiply by)
kilogram	0.001
long ton	1.0160
short ton	0.9072
pound	0.000454

Energy

(electricity)

From	To gigajoule (multiply by)
MMbtu	1.0551

Energy to natural unit

(coal, coke, wood, spent pulping liquor, refuse)

From	From gigajoule	Multiply by
Bituminous	metric tonne	0.03448
Sub-bituminous	metric tonne	0.05464
Lignite	metric tonne	0.06667
Anthracite	metric tonne	0.03610
Coal / Coke	metric tonne	0.03469
Petroleum coke	metric tonne	0.02360
Wood	metric tonne	0.05556
Spent pulping liquor	metric tonne	0.07143
Refuse	metric tonne	(various)
Propane	cubic metre	0.03917
Diesel	cubic metre	0.02585
Other middle distillates	cubic metre	0.02585
Heavy (residual) fuel oil	cubic metre	0.02396
Natural gas	1,000 cubic metres	0.02631
Coke oven gas	1,000 cubic metres	0.05373
Electricity	megawatt hour	0.27778

Energy Form	Energy content (gigajoule per natural unit)	Consumed		
		As fuel	For non-fuel use	To produce electricity or to produce steam for sale
Electricity in megawatt hours ('000kwh)				
Natural gas (in thousands of cubic metres)				
Propane (in cubic metres)				
Diesel (in cubic metres)				
Other middle distillates - light fuel oil, kerosene, etc. (in cubic metres)				
Heavy (residual) fuel oil				
* Canadian (in cubic metres)				
* Foreign (in cubic metres)				
Steam purchased (in gigajoules)				
Wood - hog fuel, wastewater, bark, etc. (in metric tonnes)				
Spent pulping liquor (in metric tonnes)				
Refuse (in metric tonnes)				
Other (please specify type and unit of measure)				

Respondent's comment section

Statistics Canada compares responses to this questionnaire with those from previous periods. In order to reduce the necessity for further inquiries, would you please provide explanations of any significant changes in the reported data.

Certification

I certify that the information contained herein is completed and correct to the best of my knowledge and belief.

Signature

Name of signer (please print)

Official position of signer

Name of contact for further information

Telephone () _____ Fax () _____

Climate Change Voluntary Challenge and Registry / Industrial Energy Innovators

Government records industry's actions to reduce energy consumption and related greenhouse gas emissions through:

- the National Inventory of Greenhouse Gas Emissions, and
- the Climate Change Voluntary Challenge and Registry (VCR).

The National Inventory of Greenhouse Gas Emissions

The National Inventory of Greenhouse Gas Emissions is maintained by Pollution Data Branch, Environment Canada. Its first report, "Canada's Greenhouse Gas Emissions: Estimates for 1990", was issued in 1992.

This inventory of greenhouse gas emissions is the official record of all Canadian emissions and is used to make international comparisons and for monitoring Canada's 1992 Rio Accord commitment.

Efforts are underway to ensure that the database and methodology used by Environment Canada and those used by CIEEDAC, to determine GHG emissions, are compatible.

Industrial Energy Innovators

The Industrial Energy Innovator (IEI) program is a joint initiative of CIPEC and Natural Resources Canada. It promotes the implementation of cost effective physical energy intensity measures and related carbon dioxide emission reductions in a systematic fashion within the manufacturing or mining sectors.

Voluntary Challenge and Registry

The Voluntary Challenge and Registry was established in 1995 by the federal and provincial governments as part of Canada's commitment to reduce energy use and to stabilize GHG emissions at 1990 levels by the year 2000.

The Minister of Natural Resources Canada is responsible for the VCR. It is designed to register tangible, voluntary commitments to achieve Canada's GHG stabilization goals.

There are four alternative ways a company can become registered in the VCR, including registering:

- directly with the VCR,
- through CIPEC, as part of the Industrial Energy Innovator program;
- through its trade association; or
- a combination of the above.

The VCR is not an official record of industry's achievements. Rather, it is a catalogue of actions which can be used, accessed on Internet and/or by the Minister of Natural Resources Canada to illustrate industry's commitment to the Voluntary Challenge.

The VCR invites companies to register their commitment to reduce GHG emissions, develop targets with supporting action plans and to report progress.

A public registry has been established to document the commitments, action plans, progress reports and achievements.

Registering as an Industrial Energy Innovator records the commitment of a manufacturing or mining company to implement energy efficiency measures that make good economic sense, to review energy efficiency performance at least annually, and to furnish a brief annual review of its successes and/or achievements.

An Industrial Energy Innovator receives a plaque, signed by the CIPEC Chairman and the Minister of Natural Resources Canada, in recognition of the company's leadership in improving energy efficiency and thereby helping Canada meet its commitment under the 1992 Rio Accord.

A company qualifying as an Industrial Energy Innovator can, at its request, be automatically registered as such in the VCR, but this does not require a company to report additional information to the VCR.

There are 275 companies which have registered with the Voluntary Challenge Registry, as at December 27, 1996. This is an increase of 55 per cent since the last Annual Report. Of these companies, 236 registered as Industrial Energy Innovators. The remaining 39 registered direct.

As well, of these 275 companies, 186 or 68 per cent, have also submitted action plans to the VCR. These companies are marked with an asterisk * in the tables which follow.

Below are listed the companies now registered with the VCR as an IEI on a sector by sector basis. The asterisk following a company name signifies that a company has also submitted an action plan.

Industrial Energy Innovators - By Sector

Aluminum - 1994/95

Alcan Aluminium Ltd.*
Aluminerie de Becancour Inc.*
Aluminerie Luralco Inc.*
Reynolds Limited

Aluminum - 1995/96

Aluminerie Alouette Inc.*

Chemicals - 1994/95

DuPont Canada Inc.*
Harcros Pigments Canada *
Nacan Products Limited *
Synergistics Industries Ltd.*
Nordion International *

Food and Beverage - 1994/95

Andres Wines *
Coca-Cola Beverages
Labatt Breweries of Canada *
Molson Breweries *

Food and Beverage - 1995/96

CASCO Inc.
Cuddy Food Products *
Garden Province Meats Inc.
Hub Meat Packers *
Kraft Canada *

General Manufacturing - 1994/95

3M Canada Limited *
ABCO Property Management Inc.
Block Drug Company
Canadian Uniform Limited
Champion Feed Services Ltd. *

Cement - 1994/95

ESSCROC Canada Inc.*
Inland Cement *
Lafarge Canada Inc.*
North Star Cement *
St. Lawrence Cement *
St. Mary's Cement Corporation *
Tilbury Cement Ltd.*

Electrical/Electronic - 1994/95

Broan Limited *
Honeywell Limited *
Osram Sylvania
Vansco Electronics Ltd.*

Electrical/Electronic - 1995/96

IBM Canada Ltd.*
Ascolelectric Limited *
Nortel

Food and Beverage- 1994/95

H.J. Heinz Company of Canada *
Moosehead Breweries Ltd.*
Sleeman Brewing & Malting Co.*
Sun-Rype Products Ltd.*

Food and Beverage - 1995/96

Maple Leaf Meats *
Maple Leaf Pork
Maple Lodge Farms Ltd.*
Pepsi-Cola Canada Beverages

General Manufacturing - 1994/95

Maksteel Service Centre
Meridian Clemer Industries Limited
Metroland Printing, Publishing
Morton International Ltd.
Polytainers Inc.*

General Manufacturing - 1994/95

Coyle & Greer Awards Canada Ltd.*
 Crown Cork & Seal Canada Inc.*
 Duracell Canada Inc.*
 Envirogard Products Ltd.*
 Euclid-Hitachi Heavy Equipment
 Federated Co-operatives Ltd.*
 Garland Commercial Ranges Ltd.
 Gould Shawmut Company*
 Greif Containers Inc.*
 Huls Canada Inc.*
 Imperial Wallcoverings*
 Ingram & Bell Inc.
 Interface Flooring Systems*
 International Paper Industries Ltd.
 Jones Packaging Inc.*
 Kindred Industries*
 Kodak Canada Inc.*
 LePage*

Lime - 1994/95

Chemical Lime Company of Canada*
 Continental Lime Ltd.
 Global Stone Corporation*

Mining - 1994/95

Aur Resources
 Barrick Gold Corporation*
 BHP Diamonds Inc.*
 Brunswick Mining & Smelting*
 Brunswick Smelting & Fertilizer
 Canadian Electrolytic Zinc Limited*
 Cominco*
 Falconbridge Ltd.*
 Fonderie Home - Noranda
 Hemlo Gold

Mining - 1995/96

Echo Bay Mines Ltd.*
 Hudson Bay Mining & Smelting
 International Minerals & Chemicals
 (Canada)
 Potash Corporation of Saskatchewan,
 Allan*

Petroleum Refining - 1994/95

Amoco Canada Petroleum Ltd.*
 Canadian Tire Petroleum
 Chevron Canada Limited*
 Husky Oil Corporation*
 Imperial Oil*
 Interprovincial Pipe Line*
 Irving Oil Limited*
 NOVA Corporation*

Plastics - 1994/95

Husky Injection Molding Systems

General Manufacturing - 1994/95

PRO-ECO Limited*
 Renfrew Tape Limited*
 Simmons Canada Inc.*
 Starcan Corporation
 Tamrock EJC Canada Ltd.
 Tamrock Loaders*
 Teknion Furniture Systems*
 Wabash Alloys Ontario*
 Wecast Industries Inc.*
 Wyeth-Ayerst Canada Inc.*
 Viskase Canada Inc.*

General Manufacturing - 1995/96

Escalator Handrail Company
 Imperial Tobacco*
 S.C. Johnson Wax
 Superior Radiant Products Ltd.
 VicWest Steel*

Lime - 1995/96

Graybec Calc Inc.*
 Havelock Lime*

Mining - 1994/95

Hillsborough Resources Limited*
 INCO Limited*
 Iron Ore Company of Canada*
 Mines et exploration Noranda Inc.
 Noranda Metallurgy Inc.*
 Placer Dome Canada Ltd.*
 Quebec Cartier Mining Company*
 Syncrude Canada Ltd.*
 Teck Corporation*
 Westmin Resources Limited*

Mining - 1995/96

Potash Corporation of Saskatchewan, Cory*
 Potash Corporation of Saskatchewan, Lanigan*
 Potash Corporation of Saskatchewan, Patience Lake*
 Potash Corporation of Saskatchewan, Rocanville New
 Brunswick*
 Potash Corporation of Saskatchewan, New Brunswick*

Petroleum Refining - 1994/95

Parkland Refining Ltd.*
 Petro-Canada*
 Safety-Kleen
 Shell Canada Limited*
 Suncor (Sunoco Group)*
 Ultramar Canada Inc.*

Plastics - 1995/96

Downeast Plastics Ltd.

Pulp and Paper - 1994/95

Avenir Inc. *
 Canfor Corporation *
 Cascades Paperboard International
 Donohue Inc. *
 Eurocan Pulp & Paper Co. *
 Kruger Paper Inc. *
 Lake Utopia Paper *
 MacMillan Bloedel Limited *

Pulp and Paper - 1995/96

Abitibi Price
 Cariboo Pulp & Paper Company *
 E. B. Eddy Forest Products Ltd. *
 Fletcher Challenge Canada *

Rubber - 1995/95

Gates Canada Inc.

Steel - 1994/95

Algoma Steel Ltd.
 AltaSteel Ltd. *
 Dofasco *
 IVACO Inc.
 Slater Steels HSB Division *
 Stelco Inc. *
 Stelco - Hilton Works *
 Steel - 1995/96
 Altas Specialty Steels
 CHT Steel *
 Co-Steel Lasco
 Frost Wire Products Ltd. *

Textiles - 1994/95

Agmont Inc.
 Albarrie Canada Limited
 C.S. Brooks Canada Inc. *
 Canada Cordage
 Canada Hair Cloth Co. Limited *
 Coats Bell *
 Coats Patons
 Collingwood Fabrics *
 Collins & Aikman *
 Consoltex Inc. *
 de Ball Canada Inc. (J.L.) *
 Dominion Textiles Inc. *
 Fabrene Inc.
 Textiles - 1994/95
 Dominion Specialty
 Spinrite Inc. *

Transportation - 1994/95

Accuride Canada Inc. *
 Altek Automotive Castings *
 CAMI Automotive Inc. *
 Canadian General Tower Limited
 Chrysler Canada *
 Eaton Corporation *
 Ford Motor Company of Canada *
 Freightliner of Canada Ltd. *

Pulp and Paper - 1994/95

Maritime Paper Products Limited *
 Rainy River Forest Products Inc.
 Repap Enterprises Limited *
 St. Marys Paper Ltd.
 Stora Forest Industries Limited *
 Weyerhaeuser Canada *

James McLaren Industries Inc. *
 Noranda Forest Inc. *

Tembec Inc. *
 Spruce Falls Inc.
 Weldwood of Canada Limited *

Rubber - 1995/96

Michelin North America

Steel - 1994/95

Stelco Fasteners Ltd. *
 Stelco-McMaster Ltee *
 Stelfil Ltee *
 Stelpipe Ltd. *
 Stelwire Ltd. *
 Sydney Steel Corporation *
 Welland Pipe Ltd. *
 Steel - 1995/96
 Gerdau Courtice Steel Inc.
 Lake Eire Steel Company Ltd. *
 LaurelSteel

Textiles - 1994/95

Glendale Yarns Inc. *
 Glenelg Textiles Limited
 LaGran Canada Inc.
 Lincoln Fabrics Ltd.
 Nova Scotia Textiles Limited *
 Peerless *
 The Britex Group
 The Cambridge Towel Corporation *
 The Stewart Group Limited
 Union Felt Products Inc. *
 Vagden Mills Limited
 Vitafoam Products Canada Ltd. *
 Weavexx *
 Textiles - 1994/95
 Velcro Canada Inc.

Transportation - 1994/95

Navistar International Corporation *
 Oetiker Limited *
 Orenda Aerospace Corp. *
 Orion Bus Industries Ltd. *
 Polywheels Manufacturing Limited *
 Prevost Car Inc.
 Rockwell International
 Russell Metals

Transportation - 1994/95

General Motors of Canada Ltd.*
 Kelsey Hayes Canada Ltd.*
 McDonnell Douglas Canada Ltd.*

Transportation - 1995/96

Allied Signal Aerospace Canada *
 Bombardier Inc.*

Transportation - 1994/95

Toyota Motor Manufacturing Canada *
 Volvo Canada Ltd.*
 Woodbridge Group *

Magna-Cosma Body & Chassis Systems

Pratt & Whitney *

Companies Registering with the VCR Direct

The following 39 companies have registered direct with the VCR. Of these 17 companies or 44 per cent, have also submitted action plans.

Chemicals

Bayer Rubber Inc.*
 Boehme Filatex Canada Inc.
 Celanese Canada Inc.*.
 Chinook Group
 CIBA-Geigy Canada Ltd.*
 Dow Chemical Canada Inc.*
 Elf Altochem Canada Inc.*
 H. L. Blatchford Ltd.

Chemicals

ICI Canada
 Jansen-Ortho
 Methanex Corporation *
 Monsanto Canada Inc.
 Novacor Chemicals (Canada) Ltd.*
 Petromont Inc.
 Rhone-Poulenc Canada Inc.
 Unilever Canada Limited

Electrical / Electronic

General Electric Canada Inc.

Food and Beverage

Burns Foods (1985) Ltd.
 Culinar Inc.

Food and Beverage

Nestle Canada Inc.*

General Manufacturing

Canada Brick Co.
 Imasco Ltd.

General Manufacturing

Jannock Brick Group
 Sika Canada Inc.

Mining

Cambior Inc.*
 Fording Coal Ltd.

Mining

IUSCAR Inc.
 Viridian Inc. (formerly Sherritt Inc.) *

Pulp and Paper

Cresbrook Forest Industries Ltd.*
 Domtar Inc.*
 Kimberly-Clark Nova Scotia Inc.*

Pulp and Paper

Northwood Pulp and Timber Limited *
 Stone-Consolidated Corporation *

Petroleum Refining

Gasoduc TQM
 Mobil Oil *

Petroleum Refining

Pennzoil *

Plastics

Polar Plastics Ltd.

Rubber

Standard Products (Canada) Limited

Transportation

Rolls Royce (Canada) Ltd.

Summary: VCR Registrations and Action Plans

275 companies from 15 manufacturing and mining sectors have registered with the VCR. Of these, 236 or 86 per cent, registered through CIPEC as Industrial Energy Innovators (IEI), the remaining 39 companies registered direct.

Of the 275 registered companies, 186, or 68 per cent, have submitted energy efficiency action plans. See Figure 150.

**FIGURE
150**

Manufacturing and Mining Companies and Action Plans by Sector Registered with the VCR

Sector	No. of IEI's Registered	No. of IEI's Action Plans	IEI Action Plans as % of Registered	No. of VCR Direct Action Plans	No. of Direct Registered	Total M/M VCR Registered	Total Action Plans	Plans as a % of Registered Companies!
Cement	7	7	100%	0	0	7	7	100%
Petroleum Refining	14	12	86%	3	2	17	14	82%
Pulp & Paper	23	18	78%	5	5	28	23	82%
Aluminum	5	4	80%	0	0	5	4	80%
Lime	5	4	80%	0	0	5	4	80%
Transportation	26	21	81%	1	0	27	21	78%
Mining	29	22	76%	4	2	33	24	73%
Steel	21	15	71%	0	0	21	15	71%
Food & Beverage	17	12	71%	3	1	20	13	65%
Electrical / Electronic	7	5	71%	1	0	8	5	63%
General Manufacturing	44	28	64%	4	0	48	28	58%
Chemicals	5	5	100%	16	7	21	12	57%
Textiles	29	16	55%	0	0	29	16	55%
Plastics	2	0	0%	2	0	4	0	0%
Rubber	2	0	0%	0	0	2	0	0%
Total	236	169	72%	39	17	275	186	68%

Letters of Cooperation (LOC's)

Over the past two years, CIPEC has entered into Letters of Cooperation (LOCs) with 31 associations and six individual companies.

The associations are:

Aerospace Industries Association of Canada	Canadian Gas Association
Alliance of Manufacturers & Exporters Canada	Canadian Lime Institute
Alliance - Newfoundland	Canadian Petroleum Products Institute
Alliance - Nova Scotia	Canadian Plastics Institute
Alliance - New Brunswick	Canadian Pulp and Paper Association
Alliance - PEI	Canadian Steel Environmental Association
Alliance - Ontario	Canadian Textile Institute
Alliance - Manitoba	Cement Council of Canada
Alliance - Saskatchewan	Council of Forest Industries
Alliance - Alberta	Electro Federation Canada
Alliance - British Columbia	Mining Association of Canada
Aluminum Industry Association	Motor Vehicle Manufacturers Association
Automotive Parts Manufacturers' Association	Ontario Food Processors Association
Canadian Chemical Producers Association	National Dairy Council of Canada
Canadian Fertilizer Institute	Rubber Association of Canada
Canadian Foundry Association	

The companies are:

Kraft Canada Inc.	Molson Breweries
Maple Leaf Foods Inc.	Moosehead Breweries Limited
McCain Foods Limited	Labatt Breweries of Canada

Set out below is a sample Letter of Cooperation

"By this letter of cooperation, (LOC), the Association in collaboration with CIPEC, undertakes to encourage its member companies to develop and implement plans for energy efficiency as a means of becoming more competitive, thereby participating in helping to meet Canada's carbon dioxide emission stabilization goals.

The Association will work with its member companies to:

1. Appoint a CEO to the CIPEC Policy Board.
2. Establish an industry sector Task Force within CIPEC to develop sector targets and to develop plans to continually improve energy efficiency in relation to such targets.
3. Provide input to reports and studies prepared by or for CIPEC or government on sector energy efficiency improvement performance or potential.
4. Identify industry sector opportunities for the promotion of industrial energy efficiency, including training and technology.
5. Distribute CIPEC material supporting energy efficiency, as appropriate.
6. Support research activity aimed at improving the efficient use of energy.

CIPEC will provide:

1. Sector data on energy efficiency and/or other criteria mutually agreed upon by the sector Task Force and CIPEC.
2. Administrative support to the Task Force in response to its needs.
3. Public recognition of participation in CIPEC for leadership in improving energy efficiency.
4. Access to CIPEC support service, including training, On-Site Human Resources, Sector Studies, Performance Contracting, technology development, and Task Force Marketing.
5. Promotion of the progress of industry-at-large in meeting the goals of CIPEC and Canada in terms of improving energy efficiency and helping to meet Canada's carbon dioxide emissions stabilization goals.
6. Communication linkages with governmental agencies and other related associations on energy efficiency matters.

Further, both parties recognize that: a) this voluntary agreement may be terminated at any time by either party, and b) as a participant, the Association shall be entitled to use the logo and other intellectual property of CIPEC in its promotion of industrial energy efficiency.

Accepted and agreed to this _____ day of _____, 1994

Chuck Hantho, Chair
Policy Board, CIPEC

Association Chair

=====

For more information about CIPEC and its activities, write, fax or call:

Philip B. Jago
Chief, Industrial Energy Efficiency Initiative
Natural Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4
Tel: (613) 995-6839
Fax: (613) 947-4121

=====

Canadian Industry Program for Energy Conservation (CIPEC) 1996

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Canadian Industry



Program for



Energy Conservation



1996 / 1997 Annual Report



CIPEC

Our Mission:

To help Canadian industry reduce energy consumption, increase energy efficiency, and reduce greenhouse gas emissions by working with industry to develop and implement energy conservation projects and programs.



1996-1997 CIPEC Annual Report

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February 25, 1998

The Honourable Ralph Goodale
Minister of Natural Resources Canada
Ottawa, Ontario K1A 0A6

Dear Minister,

I am pleased to present CIPEC's 1996/97 Annual Report.

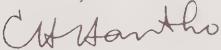
This year's report clearly shows that Canada's manufacturing and mining industries are succeeding in becoming more effective users of energy and that the voluntary approach is working. There are now hundreds of Canadian companies within all sectors and regions developing comprehensive energy management plans, making energy efficiency improvements and registering these plans with the Voluntary Challenge and Registry Program (VCR).

These improvements are assisting companies to become more competitive at the same time that they are contributing to Canada's efforts to reduce energy-related emissions of carbon dioxide. Improved energy use has been particularly evident during the last three years of the reporting period. Since 1993, there has been an average annual energy intensity improvement of 1.6 percent. Data provided by Natural Resources Canada indicates energy-use-related carbon dioxide emissions have increased by less than 1 percent for the years 1990-1996 for the manufacturing and mining sectors.

As you are aware, CIPEC is a key element for the manufacturing and mining sectors' response to Canada's National Action Program on Climate Change. CIPEC provides a mechanism for promoting effective energy use and competitiveness while limiting energy-related greenhouse gas emissions. This year CIPEC has grown to 20 sector task forces and includes the participation of 30 trade associations and industry groups representing over 3,000 companies.

Canada's manufacturing and mining industries are proud of their performance to date and look forward to reporting further gains in improving energy use. Through CIPEC, Canada's manufacturing and mining industries value our continued close cooperation with your Department.

Sincerely,



Charles Hantho
Chair, CIPEC Executive Board

EXECUTIVE OVERVIEW

The charts and performance data shown in this report accurately portray the important progress that Canadian manufacturing and mining industries—working cooperatively under the auspices of the **Canadian Industry Program for Energy Conservation (CIPEC)**—are making toward improved energy use, thus contributing to economic competitiveness and Canada's National Action Program for Climate Change.

The following results are significant:

- There are 20 task forces now participating in CIPEC, representing almost 90 percent of secondary industrial energy demand in Canada.
- Since 1990, Gross Domestic Product (GDP) has risen 11.1 percent while energy use has increased by 7.2 percent. In other words, about 4 percent less energy was required in 1996 to produce the same dollar amount of product as in 1990.
- Improved energy usage has been particularly evident during the last three years (1993–1996). Since 1993, there has been an average annual intensity improvement of 1.6 percent.
- On an overall basis, Canada's manufacturing and mining industries are making significant gains in the effectiveness of their energy use.
- As an environmental benefit, the energy management practices of Canada's manufacturing and mining industries are making a strong contribution to Canada's international climate change commitments. Available data provided by Natural Resources Canada indicates energy-use-related carbon dioxide (CO₂) emissions have only increased by 0.7 percent for the years 1990–1996. By comparison, Canada experienced an overall increase in CO₂ emissions of approximately 8 percent for the period 1990–1995.
- Notwithstanding this performance, there are still many opportunities for individual subsectors to further improve their energy use, thereby reducing CO₂ emissions.

THE VOLUNTARY APPROACH WORKS

This year's annual report documents the successes of a diverse range of Canadian manufacturing and mining industry sectors toward improving energy use. Canadian industry is proud of its achievements but equally aware of the considerable challenges that lie ahead if we are to continue to meet our objectives. The challenge is considerable given Canada's size, climate and economic diversity. Nevertheless, we are taking responsibility for continuing to voluntarily improve our energy use.

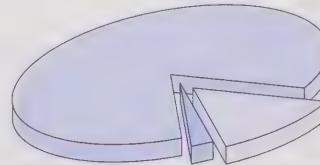
This year's report demonstrates the effectiveness of the voluntary approach. It recognizes that different industries require different solutions, and each individual industry is best positioned to find the right alternative. It provides the flexibility to meet the demands of special circumstances, and results in more effective uses of energy. The voluntary approach generates enthusiasm among employees and empowers them to seek out energy improvements.

GROWING DEPTH OF COMMITMENT

Success in any venture requires cooperation. To this end, since 1975 CIPEC has provided a voluntary focal point for thousands of Canadian manufacturing and mining industries to communicate and cooperate within and across sectors to improve energy use.

In 1996, for example, dairy companies joined together to share their experience on how to use energy better. Through CIPEC, their ideas and success stories were then shared with steel companies. Similarly, employees of rubber and textile manufacturers attended energy conservation conferences sponsored by automotive companies.

There are now 20 sectors participating in CIPEC, representing almost 90 percent of secondary industrial energy demand in Canada. CIPEC is also supported by 30 trade associations and industry groups representing approximately 3,000 companies. Chart 1 indicates the universe of Canadian industries upon which progress is being reported.



**Chart 1
Canadian Industrial Energy Use (1996)**

- CIPEC universe: manufacturing and mining
- Other mining (oil, gas, coal, etc.)
- Construction, forestry

ACHIEVING IMPROVED ENERGY INTENSITY AND EFFICIENCY

Industry's effort to improve energy use is excellent. Since 1990, Gross Domestic Product (GDP) has risen 11.1 percent while energy use has increased by 7.2 percent. In other words, about 4 percent less energy was required in 1996 to produce the same dollar amount of product as in 1990. Improved energy usage has been particularly evident during the last three years. Since 1993, there has been an average annual intensity improvement of 1.6 percent. Thus, it is possible to combine economic growth with energy intensity improvement.¹

Available data provided by Natural Resources Canada indicates energy-use-related carbon dioxide (CO_2) emissions for CIPEC industrial sectors have increased by 0.7 percent for the years 1990–1996. Yet, when increased GDP is considered, manufacturers and mining companies have improved to become 9 percent more effective than in 1990 in terms of CO_2 emissions.

Some sectors have experienced strong energy intensity improvements while others need to more fully exploit the opportunities available to them. On an overall basis, however, Canada's manufacturing and mining sectors continue to be on track in terms of our 1994 voluntary stabilization commitment to the Government of Canada.

MEETING OUR TARGETS

Canada's manufacturing and mining sectors are using energy more effectively. Figure 1 (Total Manufacturing Energy Intensity, 1990–96) and Figure 2 (Manufacturing and Mining Sector Energy Intensity) indicate that Canadian industry became slightly more energy intensive during the recessionary periods of the early 1990s as production levels were less than available capacity. From 1993 to 1996, as the economy improved, energy use also improved to reflect 96 percent of the energy intensity of 1990 levels. Overall, for the 1990–1996 period, average annual energy intensity improved by 0.6 percent.

IMPRESSIVE PERFORMANCE OF SOME SECTORS

While there is room for improvement in coming years, the progress of many individual sectors has been impressive as they have achieved both energy and environmental gains. In the mining sector, for instance, energy use decreased by 9.7 percent over this time period, despite increased GDP output of 2.9 percent.

The energy intensity of 13 CIPEC sectors has improved for the period 1990–1996 as indicated in Figure 3 (Energy Intensity Index – where 1990=1). The remaining sectors did not improve to the same extent for the 1990–1996 period. There are a number of reasons for this:

- some sectors have a higher energy intensity than 1990 but are showing evidence of improvement and appear to be on track for an eventual improvement over 1990;
- some sectors have switched to less efficient fuels which, although reducing their emissions of carbon dioxide, have led to an increase in energy used per unit of output;
- some sectors have just launched or are ready to launch comprehensive energy management programs through CIPEC and it is too early to measure impact.

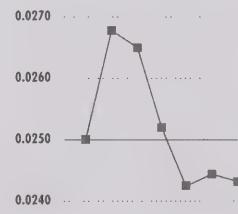


Figure 1
Total Manufacturing Energy Intensity
1990–1996

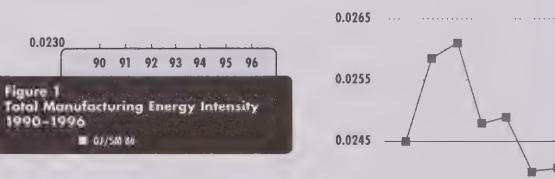


Figure 2
Manufacturing and Mining Sector
Energy Intensity

¹In 1996, total energy use among all CIPEC sectors was 2,615 petajoules, compared to 2,440 petajoules in 1990. Total GDP in 1996 for manufacturing and mining industries increased to \$108.9 billion (\$1986) from \$97.9 billion in 1990.

CONTINUED SHIFT FROM CARBON INTENSIVE FUELS

Canadian industry has been moving away from the use of carbon intensive fuels since the mid-1970s. In 1996, this shift continued. Natural gas continues to be the leading fuel source for Canadian industry with 32.5 percent of market share. Electricity follows in second position at 25.3 percent, with petroleum coke at 8.1 percent and heavy fuel oil at 6.8 percent. While the market shares of natural gas and electricity have remained relatively constant between 1990 and 1996, the shares of more carbon intensive coal and coke and coke oven gas have declined by 14 percent and the share of heavy fuel oil has declined by 13.8 percent.

PROGRESS ON MEASURING CHANGE

The ability to accurately measure progress is essential. The data must be genuine and auditable.

The Canadian Industry Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in British Columbia compiles most of the sector-specific data using data gathered by Statistics Canada. 1996 is the third year that information on energy intensity indicators based on available production data is available. Comparisons with countries around the globe in 1996 indicate a high degree of confidence in the integrity of Canada's manufacturing and mining energy use data. This strong data base is due to the spirit of cooperative dialogue and partnership between industry and government beneath the mantle of CIPEC.

Figure 3
Energy Intensity Index

Product Output Index

0.911	non-metal mining
Economic Output Index	
0.912	metal mining
0.918	non-metal mining
0.974	food industry
0.726	beverage industry
0.890	rubber products industry
0.912	plastics products industry
0.962	primary metal industry
0.953	machinery industrial
0.988	transportation equipment industry
0.511	electrical & electronic products industry
0.934	refined petroleum and coal products
0.964	chemical and chemical products

1990 Index = 1.000

Canada's manufacturing and mining industries are on track toward improving their energy use. Further progress will involve the vigorous and enthusiastic engagement of all sectors in future years. This will involve retaining participants, building on existing industry commitment and bringing new industry sectors along.

Eight of the CIPEC sector task forces have established annual energy intensity improvement targets of 1 percent to the year 2000. Variations are the cement sector, which has established an annual target of 0.7 percent per annum, the textiles sector at 2 percent, and the brewing sector at 3 percent. The remaining sectors—which are generally new to CIPEC—will be establishing targets for energy intensity improvements.

Future activities designed to accelerate and deploy new technologies will also be important in achieving greater energy intensity. Improvements will also be achieved through better housekeeping, process improvements and sharing successes across industry sectors.

In future years, measurement improvements will focus on improving the accuracy of biomass fuel accounting, the allocation of energy used in the conversion of fuels to electricity, fuel/feedstock allocations in the chemical and other industries, the correlation of data from other sources in petroleum refining industries and the measurement of coke oven gas in the iron and steel industries.

Our 1996/97 Annual Report represents the progress of each of Canada's manufacturing and mining sectors represented by CIPEC. It features individual company profiles presenting a snapshot of dozens of Canadian sectors using their leverage to induce hundreds of other companies to commit to improved energy use. Ultimately, it reflects the strength of a voluntary industry/government alliance to help Canada achieve its economic and environmental goals.

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PROFILE

Canada ranks third among the world's aluminum-producing countries with an annual production capacity of 2.2 million tonnes. The aluminum sector is a major contributor to the quality of life of Canadian residents, mainly those of Quebec and British Columbia. The 10 plants in Quebec and one in British Columbia generate 12,500 jobs with over 19.3 million person hours of employment for a payroll of about \$700 million annually. While its energy intensity index rose slightly, the sector continues to show energy efficiency much greater than 1990 levels.

CHALLENGES

Canada's aluminum producers are high energy users with purchases of fuel and hydro-electric power amounting to over \$340 million annually. Eighty-eight percent of this sector's energy use is electricity. Energy represents a major part of the final aluminum cost with about 3,000 megawatts of Canada's electricity being consumed over and above natural gas consumption.

About 70 percent of the total production of primary aluminum comes from new smelters using state-of-the-art technology. Except for the replacement of old smelters by new ones, the most important innovation on the horizon is the replacement of carbon cathode blocks by graphite blocks.

One of the greatest properties of aluminum is its recyclability. The recycling of aluminum is a priority as recycled aluminum requires only 5 percent of the energy used for primary aluminum.

Anodes used in the electrolytic process are made from petroleum coke and pitch and they generate CO₂ emissions when they are consumed in the reduction process. This is by far the main source of CO₂ emissions.

While marginal efficiency can be made through process improvements, achieving energy efficiency within the aluminum sector is closely tied to the construction of new smelters and/or the speed with which old smelters are replaced. Thus, the major challenge facing the aluminum sector is to secure funding or investments to underwrite replacement of old, less energy efficient smelters, and to expand existing new smelters. At the same time, progress is occurring in achieving marginal gains. About 80 percent of aluminum produced in Canada is exported.

ACTION REPORT

While being a high energy consumer, the aluminum sector succeeded in making excellent progress in lowering energy consumption while increasing production. In addition, through process improvements, significant progress has been made in reducing greenhouse gases produced during the smelting process.

Through a large-scale research program financed by Canada's aluminum companies, preventive measures were identified that would achieve the large-scale reduction of CF₄ (tetrafluoroethane) and C₂F₆ (hexafluoroethane) gases. The gases are produced through a phenomenon in the electrolytic process referred to as the "anode effect." Improvements in the controls of processes reduce anode effect and thus reduce greenhouse gas emissions.

ALUMINUM**SECTOR****PERFORMANCE HIGHLIGHTS**

Canada's aluminum industry has, on average, achieved close to 95 percent of its energy intensity improvement target.

Significant breakthroughs were made in 1996/97 in the reduction of CFCs.

An Action Sector Plan was launched.

100 percent of Canada's aluminum companies are now committed to the Voluntary Challenge and Registry as Industrial Energy Innovators.

Quebec companies endorse the objectives of Quebec's "Eco-geste" program.

In addition to the promotion of recycling, the aluminum sector is pursuing greater efficiency by establishing working groups in each smelter, sponsoring information exchanges with goods and services equipment suppliers and small innovation rewards programs.

An energy task force has been set up, and in collaboration with Natural Resources Canada, studies will be carried out in order to find means of improving the industry's energy efficiency. Eventually, action plans will be prepared for each smelter.

ACHIEVEMENTS

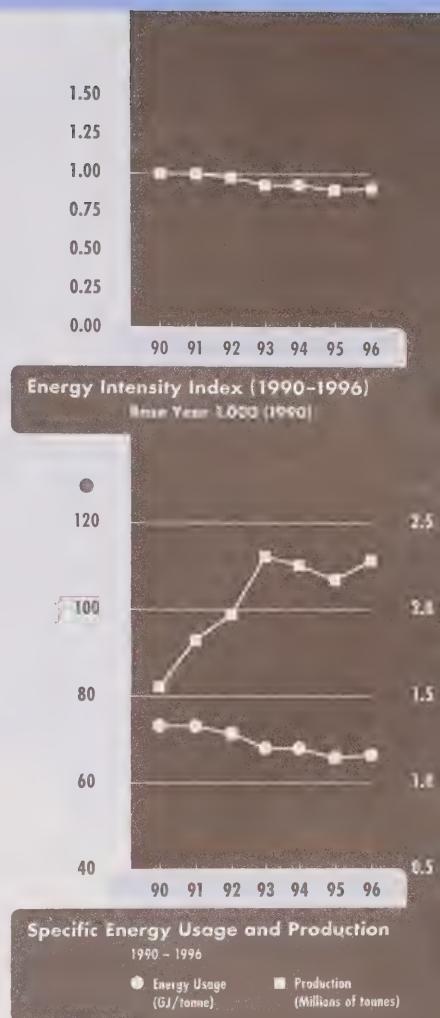
Since 1990, large-scale measurements and research programs have led to a reduction in emissions of CF_4 and C_2F_6 by almost 30 percent, with the objective to achieve a reduction of over 50 percent by the year 2000.

From 1990 to 1996, the production of aluminum increased by 40 percent while the energy consumption per tonne produced decreased by almost 10 percent.

OBJECTIVES AND TARGETS

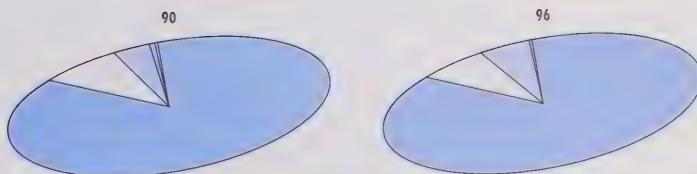
Every kilowatt of electricity saved per unit of production through increased energy efficiency or decreased energy use per unit of production represents considerable savings. As a result, each of Canada's aluminum companies are committed to cooperating toward achieving a sector-wide Energy Intensity Improvement target of 0.3 percent per annum.

Energy efficiency gains since 1990 are, on average, close to 95 percent of the target. Reflecting the large quantity of electricity required for aluminum processing and energy efficiency measures, the energy reduction targets for the years 2000, 2005 and 2010 is 0.3 percent per annum.



Specific Energy Usage and Production
1990 - 1996

● Energy Usage (GJ/tonne) ■ Production (Millions of tonnes)



Energy Source Comparison (1990/1996)

	90	96
Electricity	88.02%	88.16%
Natural Gas	7.66	6.66
Middle Dist.	0.65	0.14
Heavy Fuel Oil	3.56	5.03
Liquid Petroleum Gases	0.12	0.01



BREWERY

SECTOR

PERFORMANCE HIGHLIGHTS

Brewery Sector Guide to Energy Efficiency initiated

Continued outstanding energy efficiency progress

Commitment to a 1 percent per annum reduction in energy use

Energy savings have become integral part of cost reduction program

PROFILE

Canada's brewing companies include the two national breweries, Labatt and Molson, and a number of regional companies, Moosehead, Sleeman, Brick, Lakeport, Upper Canada, Pacific Western and an assortment of micro-breweries. They employ about 13,700 employees in 55 establishments across Canada for a total payroll of \$763 million. And, they represent over 95 percent of the brewing activity in Canada. Their total consumption of energy in 1996 was 6,065 terajoules with about 71 percent being natural gas and 21 percent being electricity.

CHALLENGES

Changes in the economy since 1990 have not had a significant impact on the ability of brewers to achieve energy efficiency. However, for Canada's brewers, energy savings are an important way to keep down costs. Thus, their energy savings targets are aggressive.

The greatest challenge facing the industry will be to aggressively seek out opportunities to improve productivity (efficiency) in response to the flat/declining market, at the same time that the market is expanding in terms of new entrants.

Further, the growing number of unregulated U-brews in Ontario and British Columbia has lessened the ability of the major breweries to maintain energy efficiency through higher capacity utilization.

ACTION REPORT

New capital investments are recognized as an important method of reducing energy use. Since last year, typical plant changes include upgrades of ammonia refrigeration systems to enable systems to operate at higher suction pressures. Other examples of energy efficient capital improvements include the replacement of existing equipment with energy efficient pasteurizers and high efficiency motors.

Housekeeping changes have included improved maintenance on steam traps and leaks in the compressed air system; increased metering and monitoring of utility usage; more frequent calibration of boiler instrumentation and boiler emission testing; more frequent calibration of combustion controls and flue gas analysis and audits of steam generation plants and steam distribution systems.

Centred on in-plant energy committees, most of the brewing companies in Canada are achieving energy efficiency improvements through employee education and training programs. There is extensive implementation of NRCan's energy awareness kits. This is supported through communications programs. Efforts are being made to take advantage of synergies by sharing successes achieved within individual plants.

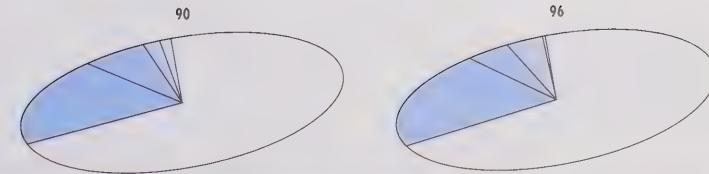
Additional strategies for achieving energy savings include employee participation at energy management workshops, expansion of energy awareness education and development of a *Guide for Energy Management*.

ACHIEVEMENTS

In 1996, the brewing industry was able to produce more beer using substantially less energy to do so. Since 1990, Canada's brewers have achieved a 15 percent reduction in total energy consumption. Economic efficiency gains are 17 percent stronger in 1996 than in 1990. Production of beer between 1990 and 1996 has remained stable, averaging 23 million hectolitres.

OBJECTIVES AND TARGETS

Specifically, Canada's brewers are committed to a 3 percent per annum reduction in energy usage per unit of production for the five-year period from 1995 to 2000. The target for 1997 is 257 MJ/hL of production. This is based on energy usage of 272.7 MJ/hL in 1995.



Energy Source Comparison (1990/1996)

	90	96
Electricity	19.56%	21.50%
Natural Gas	71.73	70.60
Middle Dist.	1.61	3.54
Heavy Fuel Oil	6.13	4.27
Liquid Petroleum Gases	0.97	0.09



Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production
1990 - 1996

● Energy Usage (GJ/hL) ■ Production (Millions of hL)



CEMENT

SECTOR

PERFORMANCE HIGHLIGHTS

- Increased use of wastes for fuel replacement and substitution of raw materials
- Increased exports of cement/clinker
- Closure of inefficient wet kilns
- Replacement with state-of-the-art processes
- Continued energy efficiency improvements and greater downstream efficiencies
- Cement production down 5.2 percent in 1995/1996

PROFILE

Canada's cement industry consists of 18 facilities involving 9 companies. It employs 2,808 people with an annual payroll of over \$81 million. Total energy use in 1996 was 57,525 terajoules. This is down from a high of 59,614 terajoules in 1990. Coal is the primary energy source for cement production. It accounts for about 40 percent of the sector's energy use followed by natural gas and petroleum coke.

CHALLENGES

Cement production and sales depend on domestic consumption and trading successes. Despite cement industry growth in domestic consumption from 1995 to 1996, 1996 domestic cement consumption was only 78 percent of the 1989 industry peak year. This represents a 4.8 percent growth from 1995. However, the export of cement has increased 72 percent above 1989 levels and clinker by 700 percent.

Canada's cement producers are engaged in determining improved methods of measuring and accounting for energy efficiency. Challenges include determining appropriate credits for the use of waste materials in kilns for cement production and accounting for embodied energy in exports.

ACTION REPORT

In 1996, the cement sector pursued three activities intended to improve energy efficiency: capital investment for modernization, fuel substitution and employee education and training. In addition, several efficiency improvements initiated in earlier years have continued.

Lafarge Richmond is shutting down two wet kilns in 1999 and replacing them with state-of-the-art energy efficiency processes.

Inland Cement in Edmonton, Alberta completed during 1997 a significant process upgrade. However, it is too early to announce, with accuracy, the energy savings achieved.

Blue Circle Canada in Bowmanville, Ontario has moved ahead with continuous energy efficiency improvements to a relatively new plant commissioned in 1991. In the early 1990s, two wet kilns were replaced with a state-of-the-art preheater precalciner kiln. This has led to a decrease in shutdowns, an increase in energy efficiency.

St. Lawrence Cement retired the wet kiln plant at Beauport, Quebec in 1997. Additional capacity was added at other plants.

1996 saw efficiency improvements in cement use by concrete producers, designers and builders. To stimulate learning and adoption of energy efficiency measures, a variety of communication methods are used by the cement sector. This includes NRCan and Ontario Hydro workshops, seminars, publications and inter- and intra-company communications.

ACHIEVEMENTS

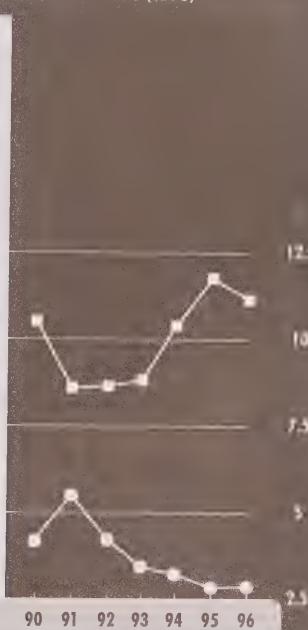
In the mid 1990s, energy efficiency gains were mainly due to replacement of wet kilns with state-of-the-art equipment and improved operating practices. Energy efficiency has since declined by 9 percent, although 1995 and 1996 have been years of energy efficiency stabilization. Canada's cement producers have had considerable success in substituting waste material as a fuel source. In 1996, waste fuels comprised 6.5 percent of the sector's consumption compared with 2.6 percent in 1990.

OBJECTIVES AND TARGETS

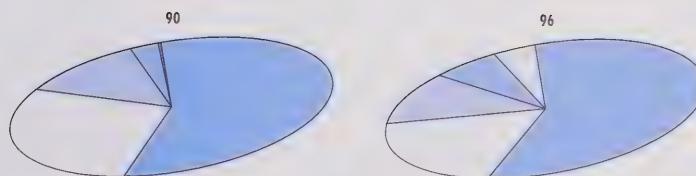
Energy efficiency improvement target for 1990 to 2000 is 0.7 percent per annum. Surpassing this target depends upon strong cement demand and the recognition of efficiencies for using waste as fuel and the energy embodied in exported products.



Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production



Energy Source Comparison (1990/1996)

	90	96
Coal/Coke	56.00%	57.20%
Natural gas	29.30	21.10
Electricity	11.80	11.20
Waste Fuels	2.70	6.60
Others	0.20	3.90

PROFILE

The chemical industry consists of 300 establishments across Canada. It employs 15,483 workers with an annual payroll of \$758 million. In 1996, the companies within this sector consumed 219,042 terajoules of energy, representing a modest increase over 1990 levels. Over the same time period, the dollar value of product output (\$86) increased about 11 percent.

Within the sector, the energy intensity performance varies. The Industrial Inorganic Chemical Producers (SIC 3711) are on target and have achieved 1990 levels of energy intensity. The Industrial Organic Chemical Producers (SIC 3712) are 12 percent more efficient than 1990 levels. The Plastic and Synthetic Resin industries (SIC 3731) are experiencing energy efficiencies and intensities of less than 1990 levels. Energy use in relation to GDP is 12 percent over 1990 levels.

While fuel use fluctuates, since 1990, the sector has experienced a fuel shift. Natural gas is used for about 54 percent of the sector's energy needs, followed by electricity at 29 percent and steam at 12 percent. The use of electricity is on the increase at the expense of the market share of middle distillates, heavy fuel oil and natural gas. The significant decrease in the use of heavy fuel oil and liquid petroleum gases since 1990 is notable.

The industry has experienced a 20 percent growth in the value of shipments since 1992. During this period, increases in greenhouse gas (GHG) emissions have been limited to 6 percent. Figure 1, 1996 Emissions of Greenhouse Gases from CCPA Member Operations; Figure 2, Emissions and Projected Reductions of Carbon Dioxide, Methane, Nitrous Oxide and Other Greenhouse Gases from CCPA Member Company Operations; and Figure 3, Global Warming Potential of Emissions from CCPA Member Operations provide additional details on GHG performance.

CHALLENGES

Canada's chemical sector includes several important subsectors. Sector information reported here represents SIC 3711, 3712 and 3731. These include industrial organic and inorganic chemicals, pharmaceuticals, paint and varnish. Many of these sectors show considerable variation in energy consumption over time. This variation may be due to the fact that natural gas is consumed as a feedstock and the data may not accurately reflect the allocation of natural gas, ethane, propane and other petroleum gases to feedstock. As some sector industries receive energy from cogeneration sources, steam is a significant energy source. Allocation issues will require ongoing attention in future years.

Figure 1
1996 Emissions of Greenhouse Gases
from CCPA Member Operations (tonnes)

	Carbon dioxide	Methane	Nitrous oxide	Other
Total Canada* (anthropogenic)	500,000,000	3,700,000	110,000	No data
Total CCPA - 1996	11,500,000	5,400	35,000	560
CCPA (1994) as % of total Canada	2.30	0.15	32.00	—

*Trends in Greenhouse Gas Emissions 1990-94 (Jaques, Boileau, Neitzert), Environment Canada, May 1996

Figure 2
Emissions and Projected Reductions of Carbon Dioxide, Methane, Nitrous Oxide, and Other Greenhouse Gases from CCPA Member Operations

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Carbon dioxide (kilotonnes)	10,900	10,900	11,600	11,600	11,600	11,400	11,400	11,600	11,700	11,600
% Change	0	0	6.4	6.4	6.4	4.6	4.6	6.4	7.3	6.4
Methane (tonnes)	2,800	3,700	5,900	5,400	5,700	4,600	4,500	4,100	3,900	3,600
% Change	0	32	110	92	103	64	60	46	39	28
Nitrous oxide (tonnes)	32,600	30,000	35,400	35,000	37,700	25,700	10,400	5,600	5,400	5,400
% Change	0	-8	-9	7	15	-21	-67	83	83	83
Other	1,100	720	560	560	540	530	510	510	500	500
% Change	0	-36	-50	-50	-52	-52	-54	-54	-55	-55

Figure 3
Global Warming Potential of Emissions from CCPA Member Operations

GWP*	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Carbon dioxide	10,855	10,840	11,560	11,550	11,545	11,390	11,330	11,560	11,675	11,575
Methane	67	91	144	132	140	113	110	100	96	88
Nitrous oxide	10,400	9,400	11,300	11,200	12,000	8,200	3,400	1,800	1,800	1,800
Other	940	720	600	630	490	560	550	540	530	530
Total	22,262	21,051	23,604	23,512	24,175	20,563	15,390	14,000	14,101	13,900
% Reduction vs. 1992	0	-5	6	5	9	-9	-31	-37	-37	-37

*Global Warming Potential of Emissions in Kilotonnes

CHEMICAL

SECTOR

PERFORMANCE HIGHLIGHTS

Growth of 20 percent in value of shipments since 1992

Greenhouse gas emissions from Canadian Chemical Producers Association (CCPA) member facilities limited to 6 percent increase since 1992

Examples of Actions Taken:

Kronos Canada Inc. targeting a reduction of CO₂ emissions by 17,000 tonnes per annum by 1998

Sterling Pulp Chemicals Ltd. to reduce fossil fuel consumption by more than 60 percent

DuPont Canada Inc. estimates reduction of nitrous oxide emissions by 80 to 90 percent, equivalent to nearly 10 million tonnes per year of carbon dioxide

CCPA members with 100,000 tonnes per year or more of CO₂ emissions register with the VCR. CCPA registers as an association on behalf of all members

CCPA reports annually on emissions and projections for all substances of environmental concern, including greenhouse gases

ACTION REPORT

The following are examples of a few of the actions that have been taken by the chemical sector:

Kronos Canada Inc. signed an agreement which will enable it to reduce carbon dioxide emissions by 17,000 tonnes per annum by 1998. As a by-product of the manufacturing process, CO₂ will be sold to Air Liquids Canada, which will prepare it for use in the agri-food and other industries for quick freezing and the production of soft drinks, as well as the treatment of effluents. A pipeline will link the two companies.

Sterling Pulp Chemicals Ltd. is spending more than \$400,000 to install a hydrogen compressor and pipeline at its Buckingham facility. This will enable the company to take the hydrogen produced as a by-product of the electrolysis process and use it as fuel in its steam plant. The project will reduce the plant's fossil fuel consumption by more than 60 percent, which represents a reduction in all consumption of 2.7 million litres per annum.

Construction of the nitrous oxide abatement project at the DuPont Canada Inc. Maitland site was completed in July 1997. Commissioning and start-up took place in August, and the equipment is meeting expectations. DuPont estimates that emissions of nitrous oxide at the site will be reduced by 80 to 90 percent in the first 12 months of operation, and expects even greater reductions as experience with the system grows.

Sarnia Esso Polyethylene and PVC Plant has developed a joint venture for co-generation between Dow Chemical Canada, Bayer Inc. and NOVA Chemicals Ltd. The cogeneration project provides highly efficient energy utilization and lower greenhouse gas emissions.

ACHIEVEMENTS

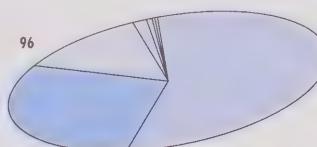
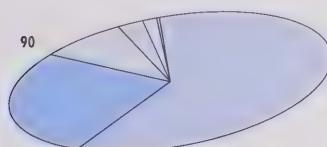
Chemical sector companies have been active in managing the movement toward increasing energy efficiency. Part of their success has been the linkages with other industry associations. They have been leaders in publicly reporting progress in both the National Environmental Registry Masterplan and the Voluntary Challenge and Registry Program.

In the CCPA, public communications is a high priority. Many member companies have been active in communicating progress through local community awareness panels established under Responsible Care®. They are actively soliciting input on all aspects of the GHG issue through the CCPA National Advisory Panel and the community dialogue process. In addition, CCPA places the annual Reducing Emissions report on the CCPA website. Further, they have been active participants in many public forums and workshops.

OBJECTIVES AND TARGETS

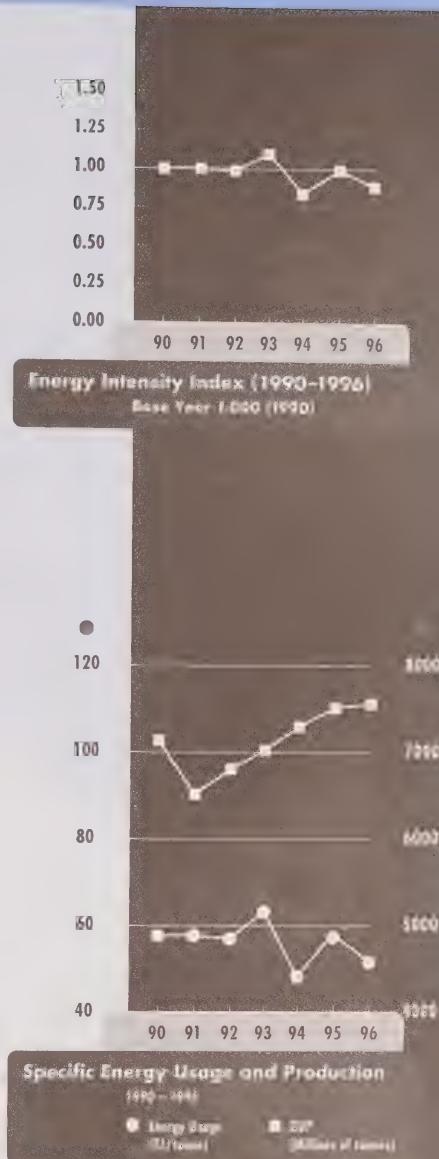
Although continued progress is being made to reduce emissions on a unit of production basis, the goal of the chemical sector is ambitious—reduce absolute emissions from all sources, and from all sinks. Representatives of the sector believe that a long-term perspective is needed by both industry and government.

The sector will also continue to focus on improving the energy efficiency of manufacturing operations by using a combination of capital investment and focused operational programs. A final objective includes increasing energy use management including public reporting of sector energy efficiency improvement.



Energy Source Comparison (1990/1996)

	90	96
Petroleum Crk.	0.00%	0.29%
Natural Gas	61.11	55.48
Electricity	26.72	30.06
Middle Dist.	0.25	0.72
Heavy Fuel Oil	2.53	1.32
Liquid Petroleum Gases	1.33	0.01
Steam	8.06	12.12



Specific Energy Usage and Production (1990-1996)

● Specific Energy Usage
■ Production
1990 = 100
1990 = 1000



DAIRY

SECTOR

PERFORMANCE HIGHLIGHTS

Research on low-cost and retrofit energy efficiency opportunities

Education of dairy plant managers

Encouragement of industry-wide engagement in energy conservation

Slight gains in energy efficiency over 1990 during time of flat market

PROFILE

Canada's dairy product manufacturing industry is pervasive in all parts of the country, employing approximately 22,000 people in over 270 establishments. In 1996, Canadian dairies processed 72 million hectolitres of raw milk resulting in a value of shipments estimated at \$7.8 billion.

Dairy product manufacturers use energy for a variety of processes including pasteurization, churning, washing, packaging, cooling, freezing and drying. Energy systems in dairy plants are typically classified on the basis of electrical energy, thermal energy and water for cooling or steam generation. Over the last year, the dairy industry has also seen a slight shift away from electricity consumption with a noticeable increase in natural gas usage.

Except for the year of 1994, energy consumed per hectolitre of raw milk from 1991 to 1996 has remained relatively constant at an average of 4 percent below the 1990 level.

CHALLENGES

For the dairy product manufacturing industry, the road to greater energy efficiency requires paying attention to a range of other pressures and influences. For instance, the industry has seen considerable rationalization in recent years. This continued in 1996. To remain competitive, large companies are pressured to maintain and expand market share while reducing excess processing capacity.

There is also a trend in the dairy industry to process more products that are Extended Shelf Life (ESL). This process involves Ultra High Temperature (UHT) pasteurization which consumes significantly more energy than conventional pasteurization. The ESL fillers also use more energy than conventional fillers.

Finally, dairy processors continue to find themselves caught between a regulated input sector represented by the milk producers and a retail/restaurant/institutional market which continues to demand, more than ever, high quality, value-added products at the lowest possible price. This continues to drive the need for cost reduction wherever possible.

ACTION REPORT

In partnership with NRCan, the energy efficiency achievements of dairy plant managers are supported through research and education material. The National Dairy Council of Canada encourages industry-wide engagement toward energy conservation. For example, each product sector (ice cream, cheese, Fluid milk, etc.) is encouraged to implement a comprehensive set of low-cost, no-cost and retrofit improvements in dozens of areas of plant operation. These include thermal storage of recovered hot water, exterior tanker recycled water washes, and water and air leakage solutions. Companies are provided with information on cost savings and payback times.

New technologies are also profiled and evaluated. These include expert control systems, non-thermal pasteurization systems, pulsed drying systems and Just-in-Time Dairy Manufacturing concepts. Energy managers are also trained on how to measure their energy efficiency and are provided with references to global studies on successful dairy product energy management.

This year's production of a *Guide to Energy Efficiency Opportunities in the Dairy Processing Industry* is an excellent example of the information plant managers are looking for, and the steps being taken to achieve energy conservation and cost savings. In addition, dairy workers are provided with information regarding workshops and training opportunities (CIET programs) along with information on how to become Energy Efficiency Innovators.

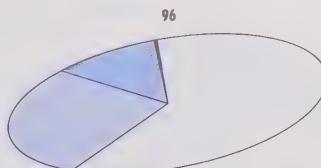
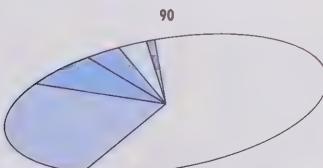
ACHIEVEMENTS

As world trade agreements move forward with liberalization goals, Canadian dairy product manufacturers and marketers will be forced to face increasing competition in both the domestic market and abroad. To flourish in the global and domestic community, dairy food manufacturers have focused on maintaining the wholesome, low-cost image of milk products. Fortunately, energy efficiency improvements have helped to keep costs down, and progress toward reducing greenhouse gas emissions is consistent with the overall image of the product.

In 1996, total energy consumption was 11,330 terajoules, down from the 1990 level of 11,952 terajoules. Even though the amount of milk processed in 1996 was also down from the 1990 level, energy efficiency (energy/kL milk processed) had improved by 3 percent. In general, energy intensity has remained relatively constant (except for 1994) with energy consumption per hectolitre of milk processed at an average of 4 percent below the 1990 level.

OBJECTIVES AND TARGETS

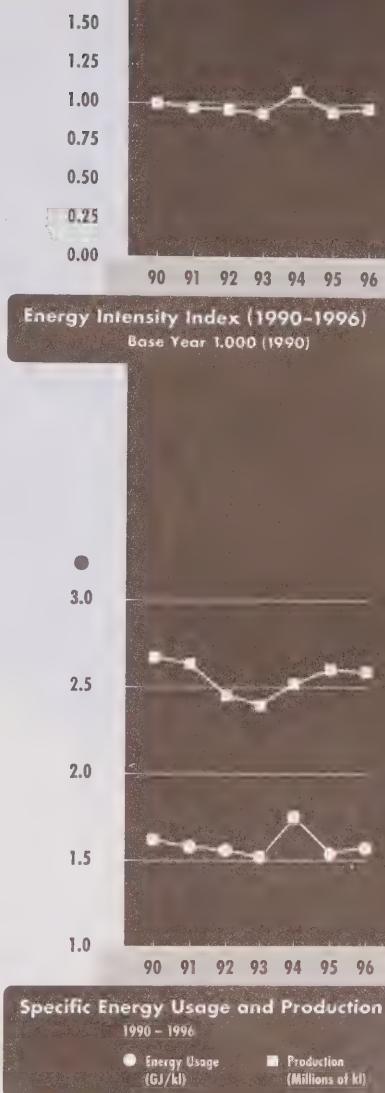
Canada's dairy industry has committed itself to a 1 percent per year energy efficiency improvement on average over the period 1996 to 2000. In 1996, their continuing challenge is to move beyond the low-cost or no cost energy efficiency improvements that have already been made. Dairy product manufacturers and marketers face higher cost energy efficiency improvements requiring large amounts of capital with a long payback period. This comes at a time when the competition for capital in dairy companies is extremely high. These realities will serve as a challenge continuing to the year 2000.



Energy Source Comparison (1990/1996)

	90	96
Coal	1.00%	0.00%
Natural Gas	60.00	61.43
Electricity	26.00	28.22
Middle Dist.	3.00	xx
Heavy Fuel Oil	7.00	xx
Liquid Petroleum Gases	3.00	0.27

xx= Confidential numbers
(Combined estimate 10.08%)



Specific Energy Usage and Production

1990 - 1996
● Energy Usage (GJ/kL) ■ Production (Millions of kL)

PROFILE

The Electrical and Electronics Industry in Canada consists of 1,313 establishments. It employs 80,900 people with an annual payroll of over \$2.66 billion. The industry is not energy intensive, nevertheless, the cost of energy is high. Companies have achieved significant improvements in energy efficiency mainly through consolidation and facility improvements. Total energy use in 1996 was 15,258 terajoules. This is down from a high of 18,326 terajoules in 1990. A large proportion of total energy consumption reduction is due to a decrease in the manufacturing sector. Major energy sources are natural gas and electricity.

The industry experienced growth in GDP from 1990 to 1996. The largest increase in GDP was between 1993 and 1995. Output has now recovered to 1986 levels with a 40 percent reduction in employees. Since globalization and inception of NAFTA, competition has become increasingly stiff.

CHALLENGES

Automation through technological advances and global competition has resulted in the industry consolidating plants and reducing the work force by 40 percent.

ACTION REPORT

Plans are in place to establish sector hot links to CIPEC website and the Electro-Federation of Canada website.

Nortel (Northern Telecom) has established eco-efficiency targets for its global operations to be achieved by the year 2000. The targets include an energy consumption reduction of 10 percent. Aggregate reduction of greenhouse gases is now at 17 percent or 6.4 million kilograms (kg). Using 1993 as a baseline year, Nortel has achieved an 8 percent reduction in electricity use, a 16 percent reduction in natural gas use and a 66 percent reduction in fuel use. The global energy "savings opportunity" at Nortel is estimated at \$19.6 million of the 1996-2000 target period. Canadian locations have already contributed to our "target" success.

A lighting system retrofit at Belleville Manufacturing resulted in a 17 percent reduction in electricity usage and a 12 percent reduction in A/C energy. The company invested \$375 thousand for the project and realizes a cost savings of \$77 thousand per annum.

The Corkstown facility in Ottawa replaced an inefficient chlorofluorocarbon (CFC) chiller with a high efficiency non-CFC chiller. The investment cost was \$350 thousand but the company is realizing an energy reduction of 53 percent and cost savings of \$186 thousand per annum.

ELECTRIC AND ELECTRONIC
SECTORPERFORMANCE
HIGHLIGHTS

- Aggregate greenhouse gas reduction of 17 percent at Nortel

- Hot links with web sites of CIPEC and Electro-Federation of Canada

- Production output increases to 1986 levels

- Gains in energy efficiency driven by global competition and automation

ACHIEVEMENTS

Gains in energy efficiency have been driven by globalization and automation within the industry. Significant improvements in energy reduction have been made through consolidation and facility improvements. Total energy use has been reduced from 18,326 terajoules in 1990 to 15,258 terajoules in 1996. Outputs have increased to the 1996 level with a 40 percent reduction in the work force. It is expected that these trends will continue.

OBJECTIVES AND TARGETS

The energy efficiency improvement target for 1990–2000 has been increased to 1.25 percent per annum.

Due to continued decreases in the manufacturing and distribution channels, the electrical and electronics sector predicts a one-third decrease in sector energy consumption during the next 10 years.

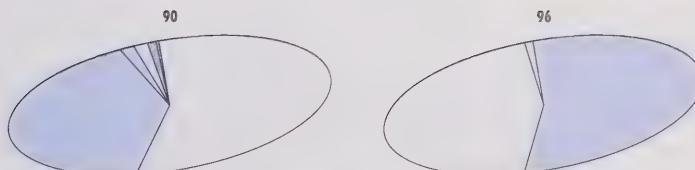


Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production
1990 – 1996

● Energy Usage (TJ/GDP) ■ GDP (Millions of \$)



Energy Source Comparison (1990/1996)

	90	96
Coal	0.08%	0.00%
Natural Gas	54.46	46.28
Electricity	41.79	53.16
Middle Dist.	0.86	0.00**
Heavy Fuel Oil	1.36	0.57
Liquid Pet. Gases	1.44	0.00**



FERTILIZER

SECTOR

PERFORMANCE HIGHLIGHTS

Fertilizer sector new to Canadian Industry Program for Energy Conservation

With production up 27 percent, potash miners are using 10 percent less energy than 1990

An energy efficiency publication is being developed as a first step toward improving sector-wide energy efficiency

PROFILE

Canada's fertilizer producers make agricultural chemicals, mixed fertilizer and mine potash. Approximately 90 percent of Canadian-made fertilizers are used in crop production and the remaining 10 percent are used in cleaning products or in manufacturing processes. Fertilizer products such as ammonia are common in household cleaning products and detergents. Manufacturers use these products to produce synthetic fibres, plastics, glues and metals. Municipalities and industries also use these products to treat waste water and contaminated soil. Significant quantities of natural gas are required as a feedstock to generate hydrogen, an essential ingredient in the production of ammonia.

There are 155 fertilizer establishments across Canada, including 11 potash mines, employing 5,112 people. Others work for fertilizer distributors, wholesalers and retailers. The total direct payroll is about \$243 million.

The market share of fuels used by this sector has not changed significantly since 1990. Of the 82,939 terajoules consumed, natural gas provides 85 percent of the energy followed by electricity at 13 percent. The use of natural gas rose slightly since 1990 at the expense of electricity. Middle distillate gases account for about 2 percent of the energy use. The sector does not use carbon intensive fuels such as coal and coke.

CHALLENGES

Humans and animals breathe oxygen and release carbon dioxide, a greenhouse gas. Plants breathe carbon dioxide and release oxygen. It is the role of fertilizer to help reduce concentrations of greenhouse gases by increasing plant production and plant biomass which absorb carbon dioxide.

Canada is at the forefront of fertilizer production. During 1994, Canadian manufacturers shipped more than 20 million tonnes of fertilizer to customers throughout Canada and around the world. For the last three years, production has been steadily increasing at a rate of 2 to 3 percent per annum. As a result, Canadian plants are expanding.

In recent decades, tremendous human population growth has placed unprecedented demands on the food supply and the fertilizer industry. A 27 percent increase in potash production has occurred since 1990, representing a total production of 13.2 million tonnes in 1996. In contrast, the production of agricultural chemicals rose to 5.7 million tonnes, representing a 5 percent increase over 1990 levels.

ACTION REPORT

The fertilizer sector is new to CIPEC. And, while many fertilizer industries are implementing energy efficiency improvements, much of the information currently remains confidential or proprietary.

ACHIEVEMENTS

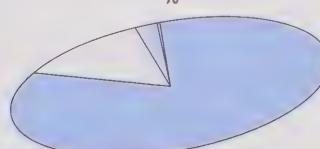
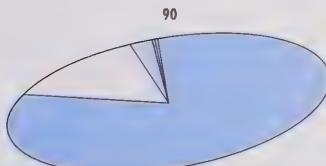
Energy is a major component of the cost of fertilizer production, especially nitrogen fertilizers. Thus energy efficiency has a high priority. Also, from an energy perspective, potash is the most significant non-metal mining industry. Total energy consumption for the combined potash and agricultural chemical industries rose 19.6 percent between 1990 and 1996 with the largest increase in energy consumption attributed to the agricultural chemical industry. This paralleled the increase in production.

Over this time of significantly increased production, the potash mining sector achieved considerable gains in energy efficiency using 10 percent less energy than in 1990. The energy use per tonne of potash production steadily declined to 3.53 gigajoules per tonne. Energy intensity indicators, in terms of GDP, have shown a modest improvement at 99 percent of 1990 levels.

While the agricultural chemical producers have improved economic efficiency by 7 percent, the energy efficiency, in terms of energy use per tonne is up by 17 percent.

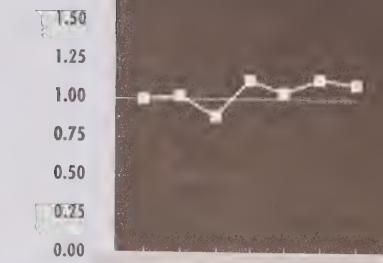
OBJECTIVES AND TARGETS

The fertilizer industry plans to promote energy efficiency by initiating data collection and consolidated reporting. An energy efficiency publication is being developed for the sector as a first step toward improving sector-wide energy efficiency.

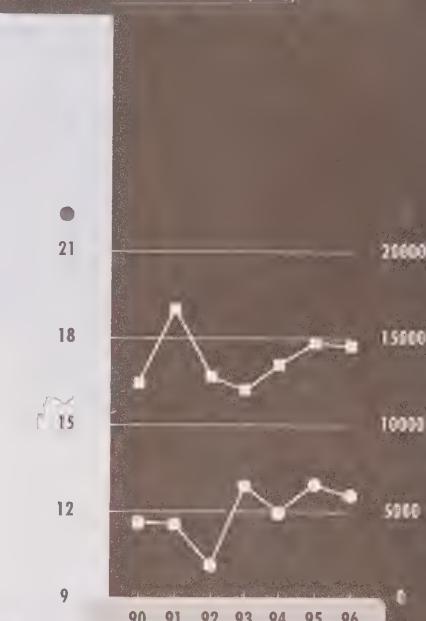


Energy Source Comparison (1990/1996)

	90	96
Natural Gas	83.40%	84.84%
Electricity	14.07	12.93
Middle Dist.	2.11	2.05
Heavy Fuel Oil	0.11	0.02
Liquid Petroleum Gases	0.19	0.12
Steam	0.13	0.04



Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production

1990 - 1996
● Energy Usage (GJ/tonne)
■ Production (Millions of tonnes)



FOOD

SECTOR

PERFORMANCE HIGHLIGHTS

At a time of increased production, energy efficiency increased by about 2.5 percent.

The fruit and vegetable industry experiences significant increases and decreases in energy efficiency.

A shift to natural gas from oil has occurred.

Food companies are investing in energy efficient capital improvements and employee involvement.

PROFILE

The food sector has 2,400 establishments, employing 112,000 people across Canada. It includes meat, poultry and fish producers, fruit and vegetables, flour, bakery products, oils and sugars and coffee and tea industries. The total payroll is \$3.858 billion, representing just under 10 percent of Canada's salaried employees.

Food processing is energy intensive due to the requirements for freezing, cooling, baking, ventilation and other processes. In 1996, energy consumption approached 79,000 terajoules, up from 73,600 terajoules in 1990. Over this time period, a significant shift to natural gas occurred with about 65 percent of food producers being supplied by this fuel. While electricity use remained stable between 1990 and 1996, steam use increased while the use of heavy fuel oil declined.

CHALLENGES

Energy costs per production hour are a major factor determining whether food producers will be profitable. Food manufacturing processes are very energy intensive. Thus, for most companies, energy efficiency is a corporate goal. Hydro-electric rate increases in production areas and the necessity of compliance with legislated provincial air quality levels both required capital funding and influenced economic intensity in 1996.

ACTION REPORT

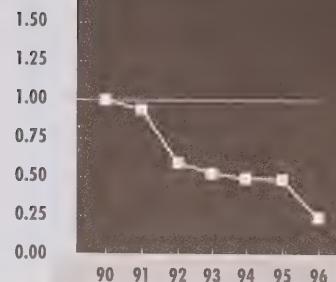
Between 1996 and 1997, the food industry sector experienced a 6.1 percent increase in production. At the same time, energy efficiency increased by about 2.5 percent. While the years 1995 and 1996 have seen a stabilization of energy efficiency improvements, the food sector is well within the stabilization of energy efficiency at 1990 levels. The meat and poultry product sectors and bakery products sectors both performed better than the food sector overall. The fruit and vegetable sector, however, has under-performed as energy use increased by about 20 percent at a time of flat economic output in terms of GDP. However, this sector experiences swings in its energy consumption pattern.

ACHIEVEMENTS

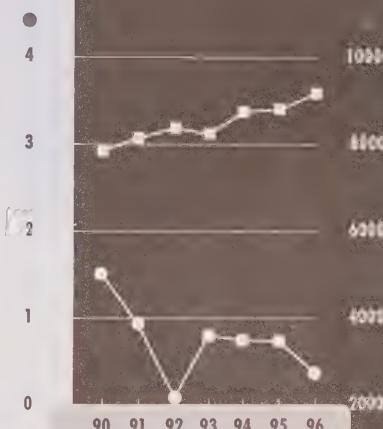
In 1996, many food companies made investments to achieve energy efficiency. Purchases of energy efficient metal lathes, metal press brakes, air pressure blanket doors and air reclaimers, as well as modernization and upgrading of existing equipment and facilities, all assisted companies to improve energy efficiency levels.

The year 1996 at McCain Foods Ltd. provided an opportunity to focus on areas that are critical to the competitiveness of the organization and address the issues of recognition. An awareness of the importance of energy efficiency at a time of increased production volumes was created. This was accomplished through employee involvement teams (EITs), general training sessions, employee input questions and the utilization of feedback boards and performance graphs. Within the McCain group of companies worldwide, Thomas Equipment won the McCain EIT All-stars program where employee involvement teams are recognized for their efforts in the reduction of energy, solid waste or water. Thomas Equipment manufactures equipment for the food sector.

The employees found that the best energy efficiencies were obtained through the repair of the capacitor bank and the reduction of usage in lights and fans. Energy efficiency examples include: insulating, installing switches to allow for improved control of lights, repairing thermostats, upgrading HVAC systems, shutting off fans when not in use, controlling ovens and checking gas lines. Since the project started, the demand for electricity decreased 10.5 percent. Thomas Equipment Limited has seen an improvement of 30 percent in costs per production hour.

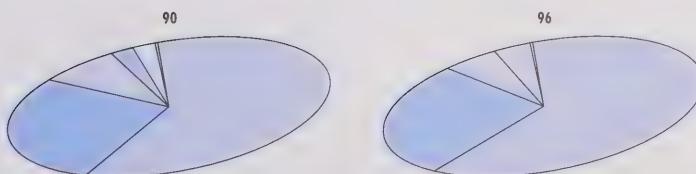


Energy Intensity Index (1990-1996)
Base Year: 1.000 (1990)



Specific Energy Usage and Production
1990 - 1996

● Energy Usage (GJ/GDP) ■ GDP (Millions of tonnes)



Energy Source Comparison (1990/1996)

	90	96
Coal	0.13%	0.00%
Coke	0.00	0.04
Natural gas	59.86	63.24
Electricity	28.02	27.63
Middle Dist.	2.16	0.00
Heavy Fuel Oil	7.67	5.47
Liquid Petroleum Gases	2.16	0.00
Steam	0.00	3.62

PROFILE



The foundry industry consists of approximately 225 foundries and directly employs approximately 15,000 people across Canada. Annual industry sales are approximately \$1.5 billion. Metal castings are the first step in the value-added manufacturing chain and are utilized in the manufacture of most durable goods. Over 60 percent of the total Canadian foundry industry output is exported, either directly or indirectly. Raw material is typically recycled metal, thereby conserving precious natural resources and energy.

FOUNDRY

SECTOR

PERFORMANCE HIGHLIGHTS

- Dominion Castings Limited awarded the 1997 Energy Efficiency Award by the Industrial Energy Forum

- Ford Motor Company of Canada Ltd., Essex Aluminum Plant, major energy use reduction project

- Wescast Industries production expansion and energy efficiency projects

CHALLENGES

It can be a challenge for the foundry industry to develop processes which reduce energy use and, at the same time, not produce by-products which contravene government environmental regulations. However, it is in our best interest to be environmentally responsible and conserve energy. Our customers insist that we continue to cut the costs of our products and, in some cases, reductions are mandated by the automotive industry. Therefore, most foundries must monitor energy consumption and implement energy savings programs to reduce operating costs.

ACTION REPORT

Dominion Castings Limited of Hamilton, Ontario received the 1997 Energy Efficiency Award from the Industrial Energy Forum. The awards were given to Dominion for completing four energy use reduction projects in 1996-97. The projects included replacing steam with natural gas, replacing brick furnace lining with modules, switching from high pressure MAPP gas to low pressure, bulk natural gas and eliminating city water to cool transformers. The company installed two self-cleaning filtration systems at our electric arc furnaces to filter lake water from Hamilton Bay, replacing expensive city water as a transformer coolant. The filtered bay water is directly returned by storm sewers. When Dominion applied to Ontario Hydro for surplus electrical power, at a cheaper rate, the company was required to implement an Energy Efficiency Program.

Ford Motor Company of Canada Ltd., Essex Aluminum Plant report on Energy Use Reduction. This plant has been certified ISO 14001—the international environmental standard—and is the fourth plant to do so. Regenerative natural gas burners were installed on a 50,000 lb. liquid aluminum holding furnace. Fuel savings, when compared to conventional natural gas burners, has been estimated by the manufacturer to be approximately 43 percent. The Burner Retrofit Project was one of the presentations made at the Transportation Sector Energy Conference in April 1996.

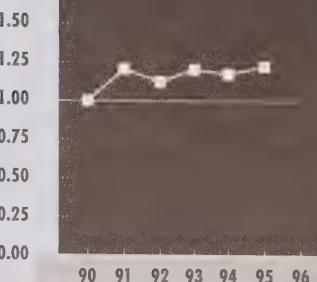
Wescast Industries has experienced significant growth due to expanded production in casting and machining of engine exhaust manifolds. The company has grown from 250 employees in 1989 to 1,200 in 1997. Historically, all these parts were made in the United States. Efforts continue to become more energy efficient and to balance energy efficiency with government environmental regulations. In this industry it is not uncommon that processes which reduce emissions also use energy. Energy efficiency projects which have been implemented include expanding and replacing three old furnaces using 600 kWh per ton of energy with new furnaces using 500 kWh per ton of energy.

ACHIEVEMENTS

Foundries have continued their efforts to become more energy efficient. Concern for the environment drives the foundry industry to be environmentally responsible, while cutting operating costs to remain competitive.

OBJECTIVES AND TARGETS

The objective of the foundry sector is to become more active again within CIPEC and to continue the process of being environmentally responsible and improving energy efficiency.



Energy Intensity Index (1990-1996)

Base Year: 1.000 (1990)

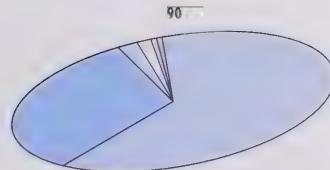


Specific Energy Usage and Production

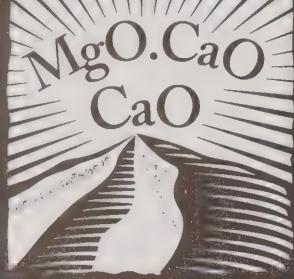
1990 - 1996
● Energy Usage
(TJ/GDP)

■ GDP
(Millions of \$)

Energy Source Comparison (1990/1996)



	90
Coal	0.44%
Coke	1.12
Natural gas	63.22
Electricity	32.59
Middle Dist.	0.67
Liquid Petroleum Gases	1.96



LIME

SECTOR

PERFORMANCE HIGHLIGHTS

New energy efficient kiln in 1997 at Graybec Calcium Inc.

Decrease in energy use per tonne and increase in production

Reduction in heavy fuel use by almost 50 percent since 1990

PROFILE

The Canadian Lime Institute (cli) consists of 14 producing sites with 591 employees and an annual payroll in excess of \$26 million. The lime data includes only merchant lime and not lime produced by captive operations.

Overall, energy consumption among lime companies rose to 16,261 terajoules in 1996. This is up by 11 percent since 1990. At the same time, tonnage production increased by 23 percent to 2.2 million tonnes. Since 1990, industry energy use per tonne of production has shown a steady decline. By 1996, an impressive 9 percent increase in energy efficiency per tonne had been attained.

Three fuels have captured 89 percent of the energy share: natural gas at 51 percent, petroleum coke at 21 percent and coal at 17 percent. The use of coal and heavy fuel oil has declined.

CHALLENGES

Several obstacles face the lime sector in its continuing drive to meet its energy efficiency targets. The first challenge involves the difficulty in finding technological changes that will make the calcining process more energy efficient. A second challenge involves the availability and economic feasibility of the use of substitute fuels and their subsequent impact on lime quality parameters. The inability to finance project investments is another significant problem. Difficulties are also experienced in finding qualified personnel to dedicate to energy efficiency projects. The members of the Canadian Lime Institute continue to search for solutions.

ACTION REPORT

The Canadian Lime Institute continues efforts to achieve its energy efficiency targets and actively participates at each CIPEC Task Force Council meeting. Member companies realize the importance of employee education and participation in the reduction of energy use. To stimulate efforts, the CLI newsletter, which includes a CIPEC and Voluntary Challenge Registry Program (VCR) component, is issued twice a year. The CIPEC "Employee Awareness Program" has been distributed to each member company.

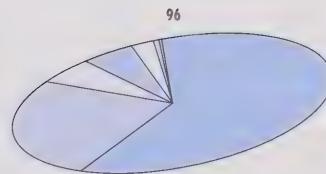
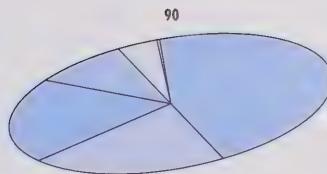
Growth in energy efficiency has been experienced by the sector through the purchase and installation in June 1997 of a new, energy efficient lime kiln by Graybec Calcium Inc. in Bedford, Quebec. Graybec plans to use the energy efficient kiln to increase production flexibility and reduce BTUs.

ACHIEVEMENTS

Six of the nine member companies of the Canadian Lime Institute have registered and submitted plans to the VCR. This represents 57 percent of the CLI's annual rated capacity. Two of the remaining three member companies (41.8 percent of the CLI annual rated capacity) have verbally committed to joining the VCR by the end of 1997. At that time, eight of the nine CLI members, or 98.7 percent, will be involved in the VCR.

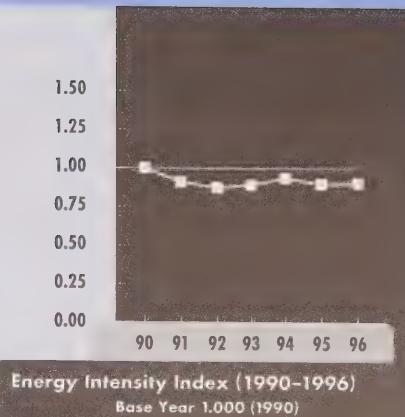
OBJECTIVES AND TARGETS

The lime sector has established a preliminary energy efficiency target of 0.5 percent to 1 percent improvement per unit of production per annum for each year through the year 2000. It is committed to achieving this target.

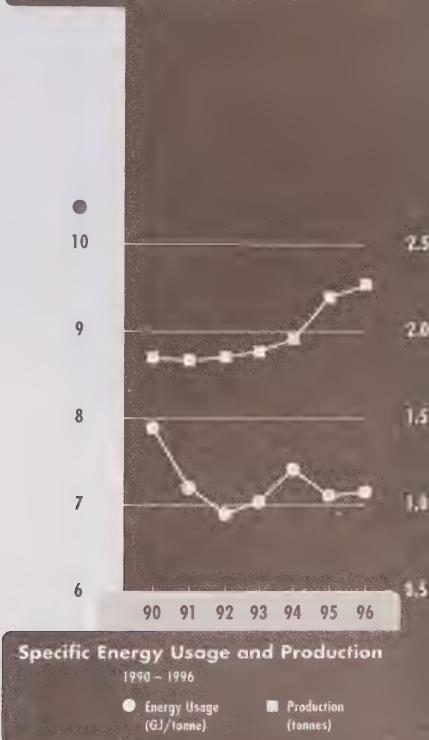


Energy Source Comparison (1990/1996)

	90	96
Coal	20.53%	0.02%
Coke	0.00	2.23
Petroleum Ck.	20.74	25.68
Natural gas	45.84	61.10
Electricity	3.87	5.26
Middle Dist.	0.19	0.74
Heavy Fuel Oil	8.76	4.89
Liquid Petroleum Gases	0.07	0.08



Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production

1990 - 1996
● Energy Usage (GJ/tonne) ■ Production (tonnes)

PROFILE



The metal mining sector directly employs over 31,000 people across Canada in 93 producing mining establishments. The mining industry continues to be the economic backbone for many Canadian regions and communities, especially in northern and rural areas. In 1996, the total mining industry accounted for \$23.7 billion or about 4.3 percent of Canada's total GDP. The mining industry is heavily dependent on electricity at 44 percent of energy usage, followed by heavy fuel oil and middle distillates. Fuel switching is occurring in the mining industry, resulting in a reduction of the use of coal since 1990.

MINING
SECTORPERFORMANCE
HIGHLIGHTS

Mining Association of Canada (MAC) Energy Conservation Task Force strengthened in 1996 to monitor energy efficiency

MAC Voluntary Challenge Registry (VCR) Tier II Workbook and Energy Efficiency Guide, Energy Managers Workshop and Internet discussion group developed

Sector energy use decreased by 9.7 percent over the 1990-1996 time period despite increasing output of GDP of 2.9 percent

CHALLENGES

The metal mining industry is export-orientated, with roughly 80 percent of production being exported. Thus, Canadian production is affected by supply and demand, by the international price of metal, and by an increasingly global mining industry. For example, the total value of metallic mineral production declined by 3.5 percent to \$11.8 billion in 1996 from \$12.2 billion in 1995, due to a significant decline in the value of copper.

Changes in the economy have contributed to mine openings and closings and significantly affected total mineral and metal production. Rebuilding of global inventory levels during 1996 increased supply, resulted in a softening in demand and a decrease in 1996 prices for nonferrous metals. Lower prices translated into lower corporate profits.

Because low domestic interest rates and inflation have made Canada an attractive place to invest, Canada's mining industry has seen increased exploration expenditures and increased capital investments in new mines, equipment and machinery. The cyclical nature of the mining industry has resulted in low metal prices and reduced profits for 1996, which have, over the same time period, constrained the industry's capital investment and return on investment strategies. However, with energy representing 10 to 15 percent of total production costs, energy efficiency represents an important part of the Canadian mining industry's international competitiveness and overall profitability.

Key challenges for the mining sector are to:

- enlist greater corporate commitment and participation in the VCR Program
- resolve statistical collection problems relating to energy consumption
- develop an Energy Management Policy for each mining organization
- ensure senior management commitment to improving energy efficiency
- develop regular staff training
- develop energy efficiency tracking and reporting methods
- develop a celebration and reward program for energy efficiency successes

ACTION REPORT

In 1996, the Mining Association of Canada (MAC) strengthened the Mining Energy Conservation Task Force as the primary vehicle for monitoring energy performance and encouraging energy efficiency improvements. The task force encouraged sector company participation in the Voluntary Challenge and Registry (VCR) Tier II Program. A VCR Workbook and Energy Efficiency Planning Guide was produced to simplify the process of VCR Action Plan reporting.

- The Task Force is developing an Energy Managers Network and Internet discussion group to encourage sharing of information and success stories while helping to resolve problems. In 1998, the first Annual Mine Energy Managers Workshop will encourage and assist in energy management planning. In addition, MAC will report energy efficiency improvements in its Annual Environmental Progress Report.

ACHIEVEMENTS

Several notable capital investments were made in new energy efficiency technology and innovations. For example, at the Falconbridge Ltd. Onaping and Fraser Mines, a 1500 hp and a 1750 hp centrifugal compressor were replaced with a 450 hp and a 1000 hp rotary screw compressor, respectively. The new compressors, including reduced maintenance costs, resulted in total net savings of 10.35 million kWhs of energy and \$1,072,650 annually.

At the Falconbridge Ltd. Sudbury Smelter, an average energy efficiency improvement of 15 percent has been achieved. Rebuilding of one furnace and mothballing of another allows the smelter to operate a single furnace with a constant and consistent concentrate feed. The reduction in idle time resulted in a 9 percent load factor improvement, while the operation of a single furnace resulted in an additional 3 MW of heat loss savings.

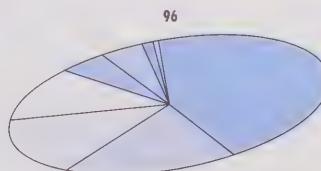
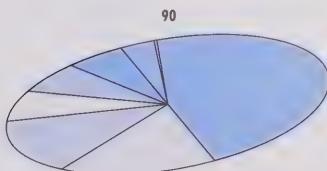
We are also pleased to report that Michael Sopko, the CEO and Chairman of INCO Ltd., accepted the role of energy efficiency champion on the VCR Council of Champions for the Mining Industry.

OBJECTIVES AND TARGETS

The mining industry has a long history of energy efficiency improvements, and is committed to achieving its energy efficiency improvement target of 1 percent every year until the year 2000. Metal miners have committed themselves to work voluntarily toward the stabilization of greenhouse gas emissions at 1990 levels by the year 2000. Improving energy consumption per unit of production and conversions to the most appropriate energy fuel are the best means of achieving this goal. Achieving energy efficiency is also seen to be an ongoing process requiring the continued development of new technology, innovations and policies.

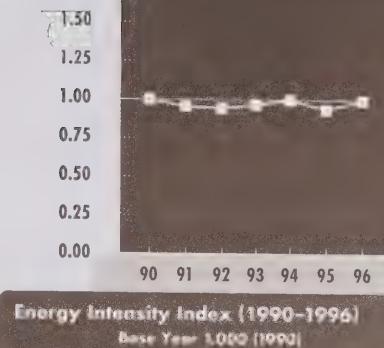
The goal of MAC is to share and communicate new information with members and to assist individual organizations with specific energy efficiency problems. Specific strategies include:

- senior management commitment
- appointing an energy efficiency champion within every organization
- identifying an energy efficiency team to assess barriers and opportunities
- setting achievable targets
- designing an energy monitoring system
- implementation of continuous reporting
- internal communication and training

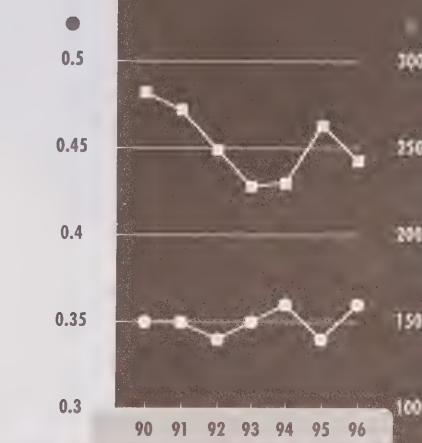


Energy Source Comparison (1990/1996)

	90	96
Coal	5.50%	5.06%
Coke	6.98	11.68
Natural gas	6.42	4.16
Electricity	46.45	44.86
Middle Dist.	16.25	15.97
Heavy Fuel Oil	14.96	17.60
Liquid Petroleum Gases	3.17	4.30
Steam	0.27	0.37



Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production
1990 - 1996

● Energy Usage (GJ/tanne) ■ Production (Millions of tonnes)



OIL SANDS SECTOR

PERFORMANCE HIGHLIGHTS

- Energy use per unit of production improved to 8.686 GJ/m³ or 79.3 percent of the 1990 level.
- CO₂ emissions decreased by 10.6 percent over the previous year, with roughly the same production rates.
- Production has increased by 55 percent since 1990; energy use has increased by only 32 percent.

PROFILE

The oil sands sector is comprised of two oil sand plants located in northern Alberta and one heavy oil upgrader in Saskatchewan. Together they supply well over 300,000 barrels per day of synthetic crude to markets in Canada and the United States.

The sector provides direct employment for over 20,000 Canadians and for another 100,000 indirectly.

Energy consumed per unit of production in the sector continued to show improvement in 1996, falling to 8.686 GJ/m³, a 2.8 percent improvement over 1995.

CHALLENGES

The improvements in energy use and emissions from the sector are the result of technological innovation and excellence. The lead time for developing and installing new processes and equipment and enhanced operational procedures are considerable.

As production increases, material handling requirements also increase. To offset this, companies will implement innovative, less energy-intensive mining and extraction methods.

ACTION REPORT

This sector continued to show strong production growth and reduced energy consumption per unit of output (energy intensity).

Total production has risen almost 55 percent since 1990, with attendant energy use increase of approximately 32 percent. As a result, energy intensity has decreased by over 20 percent since 1990. Similarly, energy intensity in 1996 improved over 1995 by 2.8 percent.

A continued focus on improving technology and operating procedures towards higher energy efficiency has resulted in improved energy intensity for the sector. Some examples include waste heat recovery for power generation, reduction in frictional pressure drop in gas pipelines and use of hydro transport of oil sand slurry.

ACHIEVEMENTS

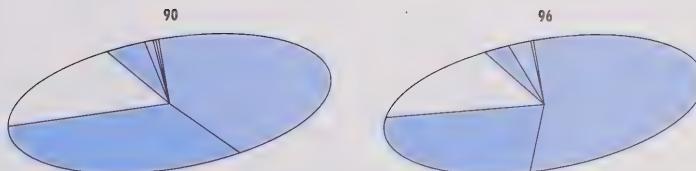
One of the companies in this sector is targeting a 23 percent improvement in energy used to produce a barrel of oil by 2001 through significant technology and operating enhancement. This constitutes an average improvement of 1.8 percent per year. These improvements, as well as the effects of a changing fuel balance, will result in a 31 percent reduction in CO₂ emissions per barrel of oil produced.

Two other specific projects demonstrate further improvements:

- recovery of hydrogen from hydrotreater purge gas streams reduces carbon dioxide emissions by 40,000 tonnes per year
- internal coating of pipelines to reduce friction saves 198,600 GJ of energy per year and reduces carbon dioxide equivalent emissions by 9,900 tonnes per year

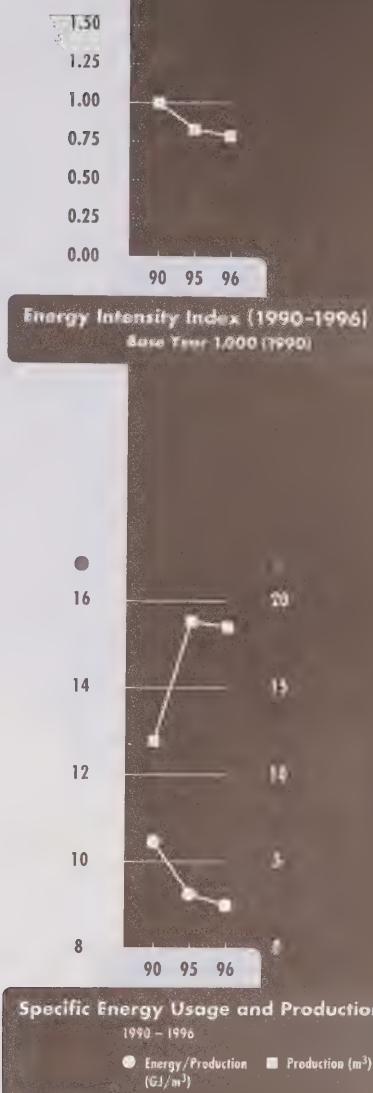
OBJECTIVES AND TARGETS

The oil sands/upgrader sector is committed to improving its annual energy intensity by at least 1 percent per year between 1995 and 2000. This will translate into less energy per unit of production and will be achieved through equipment modifications and replacement as well as improving operating procedures.

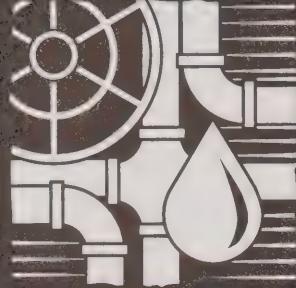


Energy Source Comparison (1990/1996)

	90	96
Petroleum Crk.	32.35%	26.02%
Natural gas	18.65	16.48
Electricity	1.07	2.18
Middle Dist.	3.69	2.43
Heavy Fuel Oil	0.25	0.18
Liquid Petroleum Gases	0.03	0.03
Still Gas	43.96	52.69



PROFILE



The petroleum products industry produces refined petroleum products at 21 conventional refineries across Canada. These products, which include gasoline, diesel, heating oil, lubricating oil, grease, etc., are supplied to all segments of the economy through a network of some 15,000 retail outlets.

The sector employs over 100,000 Canadians directly and over 250,000 indirectly. Production of petroleum products grew by 3.7 percent between 1995 and 1996 while the energy intensity decreased by 1.5 percent to 2.787 GJ/m^3 . Total energy consumed decreased by 6 percent from 1990 levels to 277,126 TJ.

CHALLENGES

The petroleum products industry continues to exceed its commitment to a 1 percent annual improvement in energy intensity. Demand for petroleum products is expected to increase as the Canadian economy and population continue to grow. More energy will be required to meet the increased demand. The industry will be challenged to minimize its total energy use by continuously improving its energy intensity. One important factor in accomplishing this is the capacity utilization in the refining sector—the higher the capacity utilization, the lower will be the energy use per unit of production. In 1996, capacity utilization was 87 percent, as compared to 85 percent in 1995.

As refineries continue to reformulate products to provide improved performance and reduced emissions, they will be challenged to manage increasing energy intensity associated with these new products.

ACTION REPORT

The sector uses the internationally recognized Solomon Energy Intensity Index (EII) to track its performance. This index uses a normalization approach which allows different refineries to be compared against each other. An index of 100 indicates efficient use of energy.

In 1996 the Canadian refining sector EII stood at 98.0, a 13.8 percent improvement since 1990 and a 2.7 percent improvement over 1995. This exceeds the industry's commitment to a 1 percent improvement per year in EII.

Between 1995 and 1996 energy consumption increased by nearly 10,000 TJ, or 3.7 percent. However, energy intensity decreased by 1.5 percent to 2.78 GJ/m^3 . Compared to the base year 1990, both total energy consumption and energy intensity decreased by 6 percent and 9 percent respectively in 1996.

Similarly, 1996 energy used per unit of value added, as measured in gigajoules per millions of \$1986 of GDP, improved by 1.4 percent over 1995 and 12 percent since 1990.

Some of the key measures in the refining area responsible for improvements in energy intensity include waste heat recovery, furnace upgrades, heat integration projects, on-line process energy monitoring, installation of variable speed control of turbines, flare gas recovery, improved distillation efficiency, increased heat exchange capacity and improved energy focus and operating reliability.

PETROLEUM PRODUCTS

SECTOR

PERFORMANCE HIGHLIGHTS

Energy intensity, as measured by the Solomon Associates benchmark, improved by almost 14 percent from 1990. 1996 performance was 2.5 percent better than 1995.

CO_2 emissions are almost 3 percent below 1990 levels.

Energy per unit of output improved to 2.787 GJ/m^3 , or 90.9 percent of the 1990 level.

Nineteen of Canada's petroleum refineries representing over 90 percent of Canada's refining industry have registered with the Voluntary Challenge and Registry (VCR) and have submitted action plans to the VCR.

The VCR action plans include several examples of significant energy reduction initiatives. For example, in the petroleum refining sector, one company continued with the installation of a \$4.5 million waste heat boiler to recover waste heat from refinery flue gas streams and generate steam. The recovered waste heat will reduce imported steam, thereby saving some one million dollars per year in energy costs, and reducing carbon dioxide emissions by 21,000 tonnes per year. Expected completion is in 1997.

ACHIEVEMENTS

The petroleum industry has enjoyed many successes in 1996 in reducing energy intensity and emissions of greenhouse gases. These are well documented in the VCR submissions of the individual registered companies. For example, one company reported reduced energy intensity in 1996 of 10.9 percent in the upstream and by 3.9 percent in the downstream refining sector.

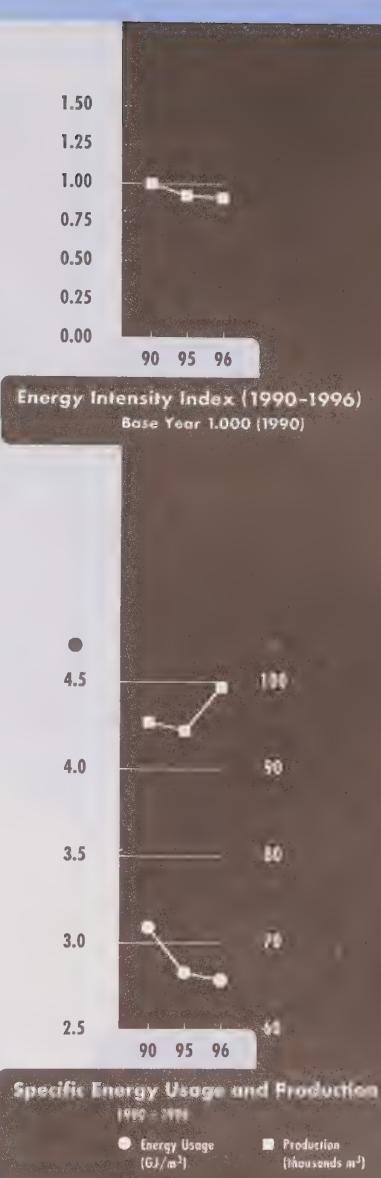
A small sampling of some specific projects includes:

- reduction of the reflux rate and bottoms recycle on a major fractionation tower resulting in annual energy savings of over 280,000 GJ, and reducing carbon dioxide emissions by 14,100 tonnes per year
- flare gas recovery yielding 23,400 tonnes per year less carbon dioxide emissions
- added heat exchange capacity to crude distillation unit reducing carbon dioxide emissions by 11,900 tonnes per year
- improved heat integration and utilization modifications to a catalytic cracking unit saving one million dollars per year in fuel and electricity, and reducing carbon dioxide emissions by 12,000 tonnes per year

The Canadian Petroleum Products Institute (CPPI), which represents companies who refine (i.e., 19 of the 21 refineries) and market petroleum products has as one of its guiding principles: member companies are committed to promote the efficient utilization of natural resources through energy efficiency in our operations. As a means of promoting and monitoring this commitment, CPPI has prepared a report entitled, "Environment and Safety Performance Report," for 1995 and 1996.

OBJECTIVES AND TARGETS

Consistent with CPPI's guiding principle on energy efficiency, the refining sector is committed to improving by 1 percent per year, for the period 1995 to 2000, its energy intensity as measured by the Solomon Index.





PULP AND PAPER SECTOR

PERFORMANCE HIGHLIGHTS

- Active involvement in reduction of energy use
- Fuel switching to biomass (wood residue and pulping liquor) continues
- Total overall energy efficiency has improved by 4 percent compared to 1990 levels
- Excluding energy from biomass, an efficiency improvement of 10 percent compared to 1990 levels has been achieved
- Energy Committee sponsors preparation of the Energy Efficiency Guidebook for the Kraft Industry and study on benchmarking for thermo-mechanical pulping and papermaking

Global Climate Change Task Force supports studies on quantification of energy embodied in exports, and on quantification of carbon sequestration associated with forest growth

PROFILE

The pulp and paper industry of Canada consists of 162 establishments, has an annual payroll of over \$2.5 billion and provides direct employment to 60,000 workers. It is thus an important contributor to the Canadian economy, representing about 2.5 percent of the GDP. With over 80 percent of the production being exported, it generates significant export revenues.

The total energy consumption in 1996 is 893,642 terajoules in 1996, which is 20 percent higher than in 1990. However, excluding energy from biomass, the increase in energy consumption over the same period is reduced to 12 percent as the industry continues to pursue its strategy to reduce the emission of greenhouse gases by switching to biomass from fossil fuels. CO₂ from biomass fuels is not included in the calculation of carbon dioxide emissions in accordance with the protocol of the International Panel on Climate Change (IPCC). As a result, the contribution by biomass fuel, which accounted for 49.2 percent of the energy supply in 1990, has increased to 52.4 percent in 1996. Heavy fuel oil contributed 7.7 percent of the total energy in 1996—down from 15.4 percent in 1990. The contribution of natural gas increased from 16.1 percent in 1990 to 16.8 percent in 1996. Electricity, supplying 22 percent of the total, is also a significant energy source.

Total production of pulp, paper and paperboard increased to 31.8 million tonnes in 1996. This represents a 24 percent increase over 1990 levels. When the increase in total energy consumption and the production increase over the same time period are combined, an improvement in energy efficiency of about 4 percent has been achieved compared to 1990 levels. When the increase consumption excluding biomass and the increase in production are combined, the improvement in energy efficiency is 10 percent compared to 1990 levels.

Both the total energy efficiencies and the energy efficiency excluding biomass fuel are lower than in 1995. However, it should be kept in mind that favourable industrial profitability existed only for a short period during 1996, as falling prices on the international market forced several companies to take down time or to switch to production of other products. Consequently, the industry's capacity utilization rate dropped from 93.4 percent in 1995 to 87.9 percent in 1996. Since a drop in the utilization rate generally reduces the energy efficiency of a plant, the industry's energy efficiency performance slipped during 1996.

CHALLENGES

With over 80 percent of production being exported, the industry is highly sensitive to international market conditions and global pressures. Maintaining and introducing new energy efficiency measures remain a major challenge due to the notoriously cyclic conditions that characterize the pulp and paper industry's economy.

ACTION REPORT

The Canadian Pulp and Paper Association (CPPA) is involved in several energy efficiency initiatives on behalf of industry. This work is carried out by committees such as the Technical Section's Energy Committee and CPPA's Global Climate Change Task Force.

Through the Technical Section's Energy Committee, CPPA sponsors an energy efficiency awards program, and in cooperation with Natural Resources Canada, preparation of an energy conservation guidebook for the kraft industry, and a study to establish benchmarking for thermo-mechanical pulping and papermaking.

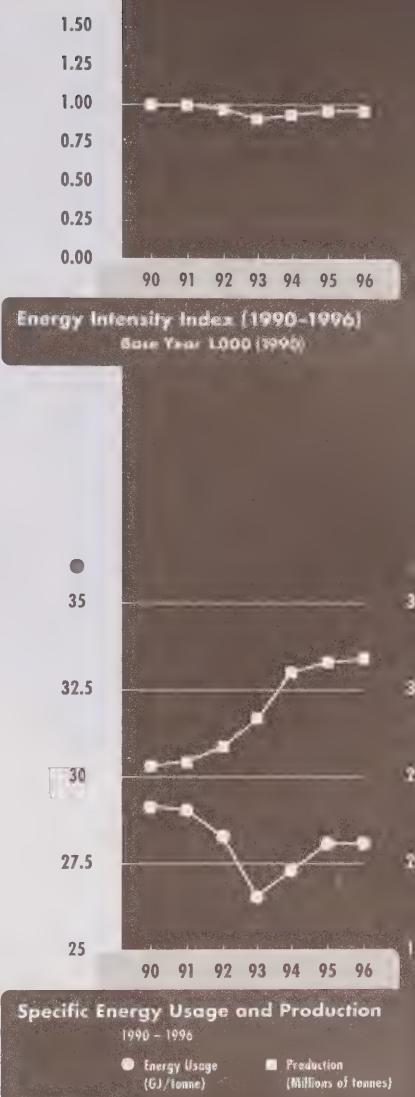
The Technical Section's Energy Committee meets several times a year for technical presentations and exchange of information between mill personnel, and sponsors sessions at the CPPA Technical Section annual conference.

The Global Climate Change Task Force supports studies examining the quantification of carbon sequestration associated with forest growth and the impact of forest management on the carbon cycle and the quantification of energy embodied in exports. The task force also developed industry guidelines for preparation of action plans for the Voluntary Challenge and Registry Program (VCR).

In addition, CPPA is working within a coalition with 21 other forest industry associations on the development of standards for a sustainable forest management certification system.

In 1996, two companies, Donohue Forest Products Inc. and Avenir Inc., in cooperation with Natural Resources Canada, developed energy efficiency guidebooks.

The pulp and paper industry contributes to technical and trade magazines featuring articles and reports describing emerging technologies to improve energy efficiency.

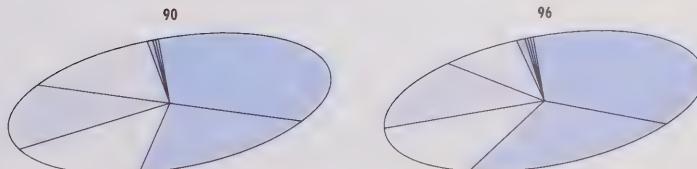


ACHIEVEMENTS

In more than 50 percent of mills, the consumption of fossil fuel per tonne of product is lower than in 1990, and in over one-third, the total fuel consumption is lower than in 1990. Since under utilization of plants as occurred in 1996 generally reduces its energy efficiency, the fact that decreases in fuel consumption per tonne continued throughout 1996 shows a substantial effort by the industry to increase energy efficiency.

OBJECTIVES AND TARGETS

The pulp and paper industry strongly supports the voluntary approach to reducing energy use and to finding solutions which will decrease greenhouse gas emissions. An energy efficiency improvement target of 1 percent per annum to the year 2000 has been established.



Energy Source Comparison (1990/1996)

	90	96
Coal	0.55%	0.24%
Natural gas	16.06	16.76
Electricity	18.40	21.71
Middle Dist.	0.16	0.36
Heavy Fuel Oil	15.43	7.70
Liquid Petroleum Gases	0.14	0.13
Steam	0.01	0.68
Wood Waste	13.25	15.05
Pulping Liquor	36.00	37.37



RUBBER SECTOR

PERFORMANCE HIGHLIGHTS

Energy intensity reduced by 11 percent compared to 1990 levels

Energy Efficiency Guidebook and Workshop helps smaller firms

Use of heavy fuel oil has declined to 15 percent from 24 percent of market share

Tire recycling has resulted in energy efficiency progress

PROFILE

The rubber products industry employs about 17,700 people across Canada in 175 establishments. The total payroll is over \$605 million. Most of the output of the rubber sector supplies the auto sectors in Canada and around the world. Products include tires, tubes, rubber hoses and belts.

Companies in the rubber sector consumed 10,841 terajoules in 1996. This was up by about 19 percent over 1990 energy consumption. Most of the energy is derived from three sources: natural gas at 50 percent, electricity at 34 percent and heavy fuel oil at 15 percent. At the same time, the sector's monetary output has increased by 33.5 percent. Output, in terms of GDP, has increased by 42 percent. Thus, the sector has made significant gains in reducing energy intensity by 11 percent compared to 1990 levels. Efficiency gains in terms of GDP are more impressive with a 17 percent improvement in energy intensity. Since 1990, the use of heavy fuel oil has declined to 15 percent from 24 percent of market share—representing a positive shift.

CHALLENGES

Rubber sector companies can be divided into large multi-national companies and smaller, locally owned enterprises. Most firms supply the automotive sector (approximately 60 percent). Larger firms, with higher output, are modern facilities with highly efficient operations. They are able to make continuous capital investments. And, they ensure the best available technology for production and energy efficiency. Smaller firms have mixed abilities to achieve energy efficient utilization. Most of the sector's energy efficiency objectives are focused on the later group.

Because the rubber industry is primarily driven by the automotive sector, output has been historically high for the past several years. Recently, strong U.S. economic activity and the low value of the Canadian dollar has increased production. The effect has been to lower energy consumption per unit of production output.

ACTION REPORT

In 1996/97, the Rubber Association of Canada produced an energy efficiency guidebook to help rubber manufacturers identify opportunities for energy savings in their plants. To introduce and promote the guidebook, the Rubber Association also conducted an Energy Efficiency Workshop. At the workshop, energy efficiency techniques were explained and sound energy management principles were offered. The guidebook and workshop were promoted extensively within the association membership and have been credited with raising energy efficiency awareness.

Tire recycling has also produced energy efficiency progress. In 1997, the Rubber Association of Canada joined other stakeholders to encourage scrap tire management programs.

The Rubber Association of Canada also develops, manages and hosts a biannual rubber recycling trade show. Work is in progress for Rubber Recycling '98 to be held in Toronto in October 1998.

This is a major North American initiative, bringing together expert speakers, entrepreneurs and industry people from around the world to seek innovative uses for scrap rubber.

A lack of good, reliable industry environmental reporting and industry data has prompted the rubber sector to develop a model for reporting emission data from plant facilities. A realistic target for energy efficiencies and reduction of GHGs cannot be established until the data reporting issue is fully addressed. When completed, the model will allow greater reporting efficiencies, benchmarking possibilities and reliable indicators to more accurately assess the rubber industry's GHG emissions and impacts of specific programs. The model could serve as a first step in rubber companies ISO 14000 company certification process.

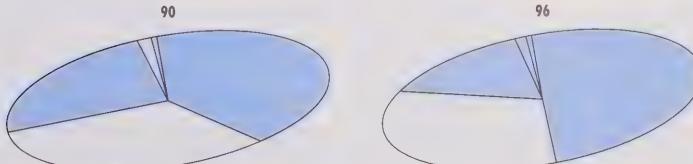
ACHIEVEMENTS

Increased energy efficiency, resulting in reduced production costs, has yielded significant savings. This has been especially important for smaller companies which have previously, because of lack of resources, been unable to address this issue.

Ongoing communication programs, such as those listed below, continue to enhance energy efficiency awareness and its benefits: 1997/98 Energy Efficiency Workshops in Mississauga and Montreal, rubber sector fax newsletter, articles in the CIPEC Heads Up newsletter and the publication of a guidebook, *Energy Efficiency Opportunities in the Canadian Rubber Industry*.

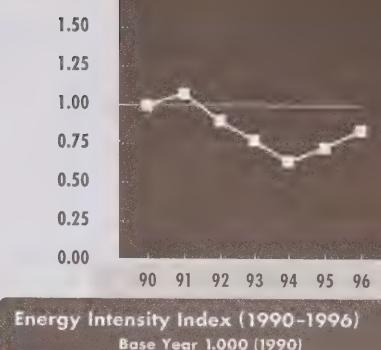
OBJECTIVES AND TARGETS

Energy is a high-cost item and a high priority for the larger companies. Usually a plant engineer is given specific responsibility to track and measure performance and identify cost savings. For larger companies this is sound business practice. The smaller firms may not have the technical or human resources to make the necessary improvements without industry support. Because a reduction in energy use can facilitate high cost savings, it is important for business as well as for greenhouse gas emission reduction that all companies within the industry utilize energy efficiency practices. This is a key strategic area for the involvement of members of the rubber industry.



Energy Source Comparison (1990/1996)

	90	96
Natural Gas	41.70	50.00
Electricity	32.60	33.90
Middle Dist.	0.50	1.10
Heavy Fuel Oil	23.90	14.60
Liquid Pet. Gases	1.40	0.50



Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production
1990 - 1996

● Energy Usage (TJ/GDP) ■ GDP (Millions of \$)



SOFT DRINK SECTOR

PERFORMANCE HIGHLIGHTS

The Canadian Soft Drink Association (CSDA) this year renewed its relationship with CIPEC. It had participated on the Food and Beverage CIPEC Task Force from 1975 until the early 1990s.

An energy profile for the industry is under development.

Savings of \$137,000 per annum and a Mississauga Industrial Energy Forum Award for Pepsi-Cola Canada Beverages Mississauga plant were achieved.

Coca-Cola Canada Limited also received recognition as an early Industrial Energy Efficiency Innovator.

PROFILE

The soft drink industry, characterized as carbonated, flavoured, non-alcoholic beverages, with more than 20 Canadian bottling plants, has an annual payroll which exceeds \$360 million. The industry directly employs more than 8,000 Canadians, and indirectly an additional 30,000 people in support industries.

The Standard Industrial Classification (sic) coding used to track soft drinks data, 1111, is now also used to track the bottled water industry which grew significantly, and thus required tracking, after the last revision of the SIC codes in 1980. Because production inputs are substantially different, additional research is required in the future to revise the data which best describes the soft drinks sector. This research is a priority for the task force, which is operating through the Canadian Soft Drink Association, which has a member product profile as characterized above.

ACTION REPORT

By applying the 3Rs, the soft drink industry has surpassed government-accepted waste reduction goals, reducing the total annual amount of packaging materials going to landfill by 67 percent between 1988 and 1996. One of the axioms of reduction used to guide the industry has been:

lightweighting = less energy (transportation)

The Canadian soft drink industry also supports the multi-material recycling approach because it diverts the most recyclable material from the waste stream at the lowest cost.

In 1997 the CSDA Technical Committee met with CIPEC to discuss measures that the association could undertake to assist its member companies with matters of energy efficiency and greenhouse gas reduction. The landmark publication, *Energy Conservation Guidelines for the Canadian Soft Drink Industry*, prepared for the CSDA in June 1978 by Kilborn Limited, will be updated as a first step. The committee member who commissioned that work over 21 years ago, Mr. James Drum, formerly of Coca-Cola Limited, is still active on the CSDA Technical Committee.

ACHIEVEMENTS

This was a year committed to planning and the renewal of relationships. While the industry reports energy efficiency gains in soft drink sector facilities, the collection, assessment and reporting of such achievements on a sectoral basis can only be done as a data mechanism is addressed in the new year.

The soft drink sector is a new addition to CIPEC. Therefore available data is limited at the time of this publication.



PROFILE

With \$11 billion in sales and \$3 billion in exports, Canada's steel industry in 1996 is a major contributor to the Canadian economy. Over 33,000 people are directly employed by the steel sector and over four times that amount are employed indirectly. The industry has invested over \$3 billion in capital expenditures since the early 1990s. In 1996 alone, \$660 million was invested. The main customers for Canadian steel lie in the automotive and transportation industries, agricultural and industrial equipment, construction, oil and gas, and consumer and industrial packaging sectors. In 1996, the Canadian steel industry produced 14.6 million tonnes of steel. Shipments totalled 14.1 million tonnes. This represents a significant increase in production and shipments over previous years.

In parallel with the increase in production, energy consumption in 1996 totalled 237,936 terajoules. There has also been a fuel shift. Over the 12-year period ending 1996, the proportion of natural gas used by Canada's steel producers has increased steadily, primarily offsetting coal. Natural gas is now being used as a blast furnace injectant and in oxy-fuel burners for electric arc steelmaking furnaces. The proportion of oil-based energy has been reduced slightly and electricity's share remains essentially steady.

CHALLENGES

In Canada, steelmaking is an advanced manufacturing industry. It must constantly keep up with rapidly changing production technologies, rapidly changing customer needs and increasing environmental expectations. Staying competitive requires innovation and investment.

Nearly all customer industries are rationalized on a North American basis. North American customers buy their steel from North American producers for use in North American plants. As such, trade is an important issue for the Canadian steel industry. While the United States is Canada's most important steel trading partner, steel producers continue to be faced with significant barriers in accessing the U.S. steel market. Recent competitive challenges include the emergence of "mini-mills" in the United States, the corporate restructuring of large North American producers and competition from subsidized steel producers from Asia, Europe and South America.

ACTION REPORT

The steel sector has continued progress toward reaching its goal for individual company commitment to voluntary energy efficiency improvements. During 1996/1997, one additional company became an Industrial Energy Innovator, boosting commitment levels to 80 percent of companies, representing 84 percent of production.

Individual steel companies implemented a range of projects and investments toward energy efficiency in 1996 and 1997. Some of these are highlighted later in this report.

AltaSteel achieved both energy savings and waste reductions through a new system of processing millscale. Environmental and operating benefits include improved energy efficiency by not having to reduce 2,000 tons of Fe₂O₃ in the electric arc furnace (EAF), and a cessation of on-site landfilling of millscale. The millscale residue or waste is now being sold as a feedstock for cement manufacturing.



STEEL SECTOR

PERFORMANCE HIGHLIGHTS

Canada's steel producers have achieved a 20.5 percent improvement in a specific energy consumption

This represents an average annual improvement of 3.4 percent since 1990

Shipments have increased 12 percent. GDP contributed by the sector has grown 5 percent while energy consumption has fallen 11 percent

Economic energy intensity has improved over 15 percent

Over this period the proportion of natural gas use has increased while coal use has decreased

Plans are in place for further efficiency improvements approaching 2000

Slater Steel HSB's installation of in-line gauge measurements to reduce off-spec material has both increased the yield and improved specific energy consumption. In the near future, a new EAF vessel with 15 percent improvement in electricity use per ton will be commissioned.

By commissioning and operating two new mechanical descalers for certain products, Stelwire found savings of over \$70,000. Energy improvements and productivity gains were achieved through the reduced consumption of natural gas for steam heating of baths and drying of coils.

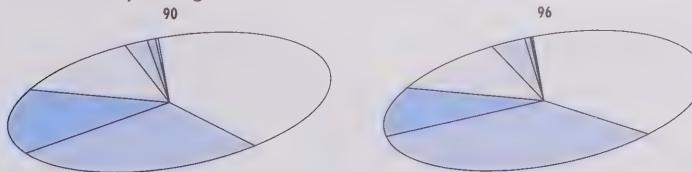
ACHIEVEMENTS

The industry measures its energy performance as specific energy consumption (SEC), the amount of energy consumed per tonne of shipments. In 1996, SEC for the sector was 16.84 gigajoules per tonne shipped. This is an improvement over the adjusted 1990 base year energy rate and represents an average annual improvement of 3.4 percent. In 1990, the industry experienced major labour outages which required adjustments to base levels of energy, shipments and economic measures. In 1996, the sector's economic energy intensity was 84.4 terajoules per million \$GDP. This represented an improvement of 15 percent over the adjusted 1990 base level.

OBJECTIVES AND TARGETS

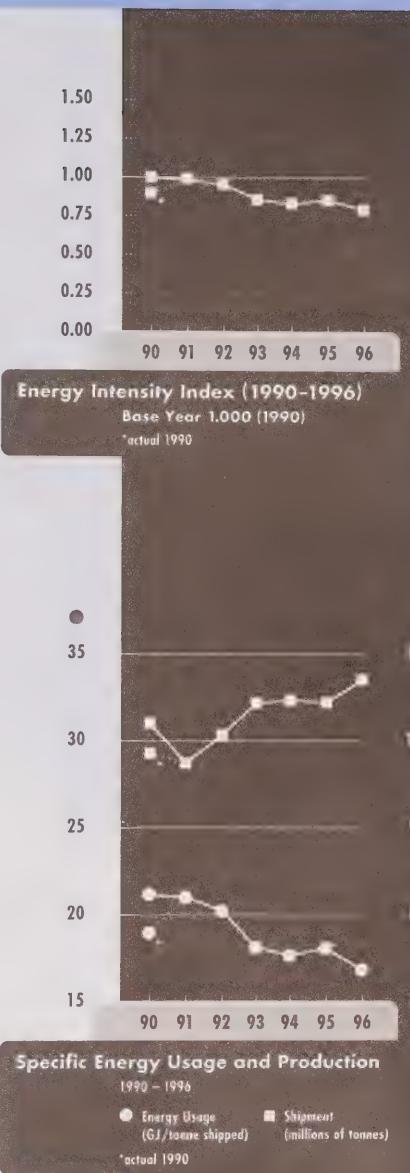
The Canadian steel industry is committed to achieving an average 1 percent per year improvement in specific energy consumption over the period 1990 to 2000 with respect to the adjusted 1990 base year rate of 21.18 gigajoules per tonne shipped.

During 1998, the sector will review, revise and extend its energy efficiency improvement commitment for the years beyond 2000. Toward the year 2000, future projects to obtain further improvements include Stelco's overhaul of their electrical system and motor replacements and Stelco Hilton Works' installation of a 15-megawatt steam turbine generator set to convert steam and by-product fuel into electrical energy. Stelco McMaster Ltée. will install a new high impedance transformer for the EBT furnace and an electromagnetic stirring system for the continuous casting machine. Stelco Fasteners will install infrared heating systems in areas of concentrated cold infiltration. In 1997, Algoma started up a thin slab caster, the first example of this less energy intensive technology in Canada. Its full impact will be felt through 1998 and 1999. Dofasco will start up its own electric motor efficiency testing unit.



Energy Source Comparison (1990/1996)

	90	96
Coal	0.07%	0.18%
Coke	42.89	39.92
Ck. Oven Gas	15.82	11.35
Natural gas	26.30	33.60
Electricity	12.19	11.00
Middle Dist.	0.74	0.43
Heavy Fuel Oil	2.32	3.43
Liquid Petroleum Gases	0.17	0.09





PROFILE

The textile manufacturing industry has three major sectors. The primary textiles sector includes manufacturers of man-made fibres and filament yarns, spun yarns, and woven and knit fabrics. The textiles products sector includes manufacturers of carpets, fabrics less than 12 inches wide, household textiles, firms engaged in contract dyeing and finishing, plus others. The third sector is producers of motor vehicle fabric accessories. In 1995, the industry employed 56,000 people and paid wages of over \$1.7 billion.

The textile industry sells to about 150 markets including agriculture, automotive, clothing, construction, environmental protection and road building. In 1997, it will export about 30 percent of its output.

In terms of 1986 dollars, the industry's 1996 value of output was \$7.7 billion, an increase of \$91 million over 1995. For the same years, the value of output in the primary textiles and motor vehicle fabric accessories sectors increased by \$102 million and \$97 million respectively. In contrast, output in the textiles products sector declined by \$102 million. Since 1990, an increase in economic output of 10.6 percent has occurred in the industry. Output gains of 9.5 percent in primary textiles and 61.5 percent in motor vehicle fabric accessories were partially offset by an 8.4 percent decrease in the textiles products sector.

Natural gas represents 62 percent of the energy consumption of the industry, and electricity represents 27 percent. According to Statistics Canada data, energy consumption in 1996 rose to 30,329 terajoules, a 39.9 percent increase over 1990 levels. However, this increase contrasts with the individual experience of major producers and is questioned by the industry.

CHALLENGES

The textile industry must overcome many challenges to meet energy efficiency targets for the year 2000 and beyond. The increased involvement of major producers is necessary if the industry as a whole is to meet its targets. To accomplish this, textile manufacturers participating in the industry Energy Task Force have accepted a leadership role in demonstrating, by example, the individual economic benefits that flow from effective energy efficiency programs at the company level.

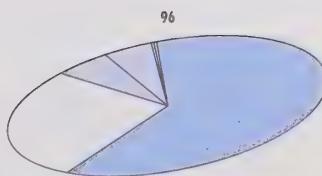
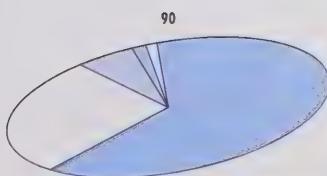
A second challenge is the development of accurate measures of energy use by the industry.

ACTION REPORT

The Textiles Energy Task Force has discovered errors and inconsistencies in the energy consumption data reported to Statistics Canada. The task force is working with firms and Statistics Canada to correct these errors. This work could not be completed in time to include a meaningful and accurate analysis of the textile industry's energy efficiency performance in this report.

OBJECTIVES AND TARGETS

The textile industry has established an aggressive target of a 2 percent per annum reduction in energy per unit of output from 1995 to the year 2000. This will result in a 10 percent improvement in five years. To achieve this target a campaign is underway to recruit at least 50 company participants in the Industrial Energy Innovator program. Methods being used include workshops, a monthly energy newsletter, training sessions, case studies and provision of information on sources of help such as literature, training and performance contracting as a source of financing.



Energy Source Comparison (1990/1996)

	90	96
Natural Gas	64.2%	62.05%
Electricity	27.86	27.44
Heavy Fuel Oil	5.61	4.65
Middle Dist.	1.23	0.31
Liquid Pet. Gases	1.1	0.21
Steam	0.0	5.35



TRANSPORTATION MANUFACTURING

SECTOR

PERFORMANCE HIGHLIGHTS

Energy intensity in 1996 is 2 percent below 1990 levels

The use of coal has declined in real terms since 1990

Effective internal energy awareness and award program for energy efficiency improvements

Energy intensity improvement target of 1 percent per annum to the year 2000

PROFILE

The Canadian automotive manufacturing industry produces light duty vehicles including cars, vans, pickup trucks; heavy duty vehicles including trucks, transit buses, school buses, military vehicles; and a wide range of parts, components and systems used in vehicles of this nature.

The sector directly employs 172,300 people in 1,336 establishments for a payroll of about \$7.2 billion per year. With manufacturing, vehicle dealers and aftermarket employees combined, this sector is Canada's largest with well over a half-million employees. In Ontario alone, it accounts for one in six jobs and contributes to 20 percent of the total provincial manufacturing GDP.

In 1996, the transportation sector consumed 65,977 terajoules, up by about 25 percent from 1990 levels. Over the same time period, gross output was up by 27 percent with GDP output being up by 21 percent. The transportation sector has succeeded in keeping energy intensity constant with 1990 levels. Energy intensity in 1996 is about 2 percent below 1990 levels. The fuel splits within the industry remain fairly constant with about 58 percent natural gas usage and 34 percent electricity usage. The use of coal has declined in real terms since 1990.

CHALLENGES

The automotive manufacturing industry is very important to the Canadian economy. Although the automotive business is cyclical, Canada's motor vehicle production has grown rapidly over the past 30 years. New capital expenditures grew rapidly after the 1965 Auto Pact and have continued to grow in real terms. For example, in 1994/95, it showed a 10.8 percent production increase. Automotive companies source major portions of their parts manufacturing product needs from Canada. Canada also attracts a significant portion of investment in new high volume vehicle models and associated parts manufacture.

Canada's automotive companies are committed to a continuous improvement in energy use. Energy efficient equipment is installed where feasible. But economic changes, such as reductions in product output, strains available dollars for energy efficiency innovations and progress.

The automotive sector faces the irony of having to use more energy to comply with mandated environmental controls in finished products. For example, emission control regulation requirements for some parts require more energy intensive exhaust and supply fan operation than previous processes.

ACTION REPORT

Several programs continue over the long term. An internal energy awareness and award program for energy efficiency improvements and the refinement of operations to perform equipment shutdowns in a more diligent manner have been particularly effective.

The Transportation Industry Energy Task Force holds semi-annual and annual energy management and energy efficiency workshops for plant energy managers. The programs increase awareness and understanding of how capitalizing on energy efficiency opportunities can reduce operating costs, increase profits and contribute to company international environmental initiatives. Senior management promotes energy management as a key component of company strategy. The Energy Task Force also provides input to company, CIPEC and government newsletters.

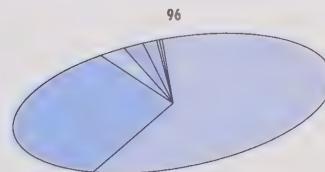
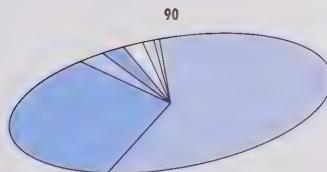
ACHIEVEMENTS

Energy consumption in the industry increased fairly steadily from 1990 with the motor vehicles sub-industry experiencing growth in energy consumption of 38 percent. At the same time, Canadian motor vehicle shipments have increased significantly to a level of 50 billion in 1995. Like the energy data, monetary production increased by approximately 20 percent over the time period under review. Measures of physical production are unavailable because of the variety of products in the industry.

Overall, companies in the transportation sector have achieved success in that economic energy intensity has varied little since 1990 and, more specifically, the sector has achieved its energy efficiency targets.

OBJECTIVES AND TARGETS

The transportation sector has established an energy intensity improvement target of 1 percent per annum to the year 2000. Energy conferences and workshops will continue to be used as a means of engaging parts suppliers in energy savings initiatives and recruiting Industrial Energy Innovators.



Energy Source Comparison (1990/1996)

	90	96
Coal	2.33%	1.23%
Coke	0.32	0.28
Natural gas	57.62	59.52
Electricity	34.19	34.32
Middle Dist.	1.18	0.00
Heavy Fuel Oil	2.43	2.09
Liquid Petroleum Gases	1.93	2.31
Wood Waste	0.00	0.25



Energy Intensity Index (1990-1996)
Base Year 1.000 (1990)



Specific Energy Usage and Production

1990 - 1996
● Energy Usage (TJ/GDP) ■ GDP (Millions of \$)



WOOD PRODUCTS SECTOR

PERFORMANCE HIGHLIGHTS

Canfor (Howe Sound Pulp and Paper) has installed improved bark presses to increase wood residue usage to offset gas consumption.

Improved DCS controls and burner management systems to offset gas consumption were installed at Canfor's Prince George Pulp and Paper Mills.

Employees at Canfor have identified over 30 ways to use electricity more efficiently and saved up to three million Kwh per annum.

PROFILE

The wood products industry consists of 2,861 establishments across Canada. It employs 19,201 workers and has an annual payroll of over \$3.2 billion. Many energy efficiency efforts in the wood products sector are integrated with the pulp and paper sector, for example, wood waste co-generation. The sector consumed 56,100 terajoules of energy in 1996, up by 43 percent from 1990. The gross economic output increased by 8 percent, and output in terms of GDP increased by 10 percent. As a result, the sector has experienced a slippage from 1990 energy efficiency levels of 32 percent and 30 percent respectively.

The increase in intensity is due primarily to a rise in natural gas consumption but most other fuels show increased levels of consumption, despite reduced market share. In areas where wood waste is consumed, the contribution of wood waste energy ranges from one-third to one-half of the total of all other fuels and its market share is rising. However, without the inclusion of wood waste data, these figures do not portray an accurate picture of the sector's energy performance.

CHALLENGES

Daily price fluctuations in world markets, especially export markets, force the industry to focus on the daily product mix and improving product marketability rather than reductions in energy use. Improved marketability is achieved by producing value added goods such as drier wood. As with processes for other value added wood products, producing drier wood is energy intensive. The challenge is to develop less energy intensive processes to produce value added goods.

A significant measurement challenge involves incorporating wood waste data into the sector's energy performance. Part of the difficulty is that wood waste is sometimes a product, and sometimes an energy source. Another issue is that use of wood waste use is often integrated with the pulp and paper sector.

ACTION REPORT

A new company policy at Weyerhaeuser directs that all replacement motors must have high energy efficiency capabilities.

NRCAN Workshop held in November 1997. In addition, Canfor employees in three northern British Columbia mills have identified over 30 ways of using electricity more efficiently, thereby saving more than 3 million Kwh per annum.

Canfor has installed new bark presses at Howe Sound Pulp and Paper that will improve bark burning and reduce gas use by 3,000 gigajoules per day. In addition, new distributed control systems and a burner management system installed during 1997 at Prince George Pulp and Paper Mills will also increase wood waste burning and reduce gas use by over 1,000 gigajoules per day.

ACHIEVEMENTS

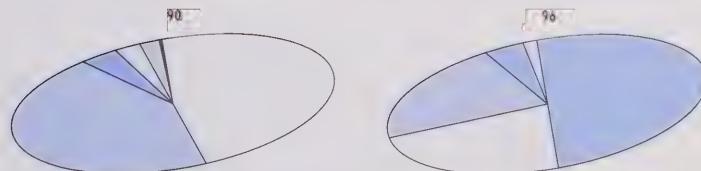
The sector has been affected by national and international economic factors. Lumber quotas in the United States have forced companies to increase their focus on marketing and product improvement—often necessitating greater energy consumption for wood drying. Poor export markets, primarily in Japan, have forced Macmillan Bloedel, Interfor and other coastal lumber mills in British Columbia to announce temporary closures. Also, in British Columbia, lumber producers have had to cope with higher wood costs due to provincial government initiatives including increased stumpage rates, increased logging regulations and reduced timber supplies.

There are no physical production estimates for this sector, primarily because of the variation in products. The wood products industry uses wood waste to fire its drying kilns and to generate heat for other purposes. Statistics Canada has received data on the quantity of wood waste used in the wood products industry since 1995.

OBJECTIVES AND TARGETS

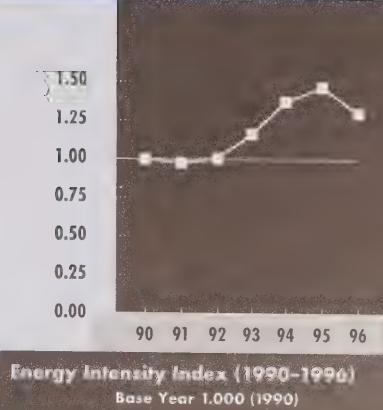
The wood sector has set an energy efficiency improvement target of 1 percent per annum to the year 2000. Often, energy efficiency efforts are an ongoing part of overall mill modernization programs.

The sector will continue to promote the Energy Efficiency Opportunities manual developed in 1996 for the sector, and *Energy Efficiency Opportunities in the Solid Wood Industries*, a manual supported by CIPEC, NRCAN and the Council of Forest Industries and distributed to wood products mills throughout Canada.



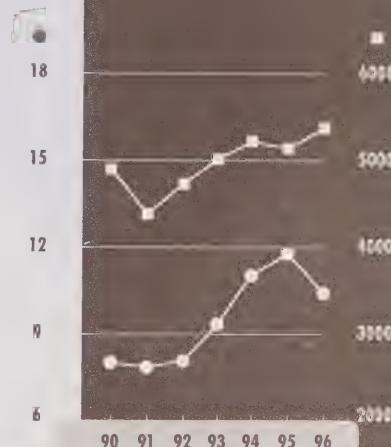
Energy Source Comparison (1990/1996)

	90	96
Coal	0.03%	0.00%
Natural gas	47.93	23.68
Electricity	43.87	21.07
Middle Dist.	2.44	3.92
Heavy Fuel Oil	3.62	1.17
Liquid Petroleum Gases	2.11	0.00
Wood Waste	0.00	50.16



Energy Intensity Index (1990-1996)

Base Year 1.000 (1990)



Specific Energy Usage and Production

1990 - 1996

● Energy Usage
(TJ/GDP)

■ GDP
(Millions of \$)



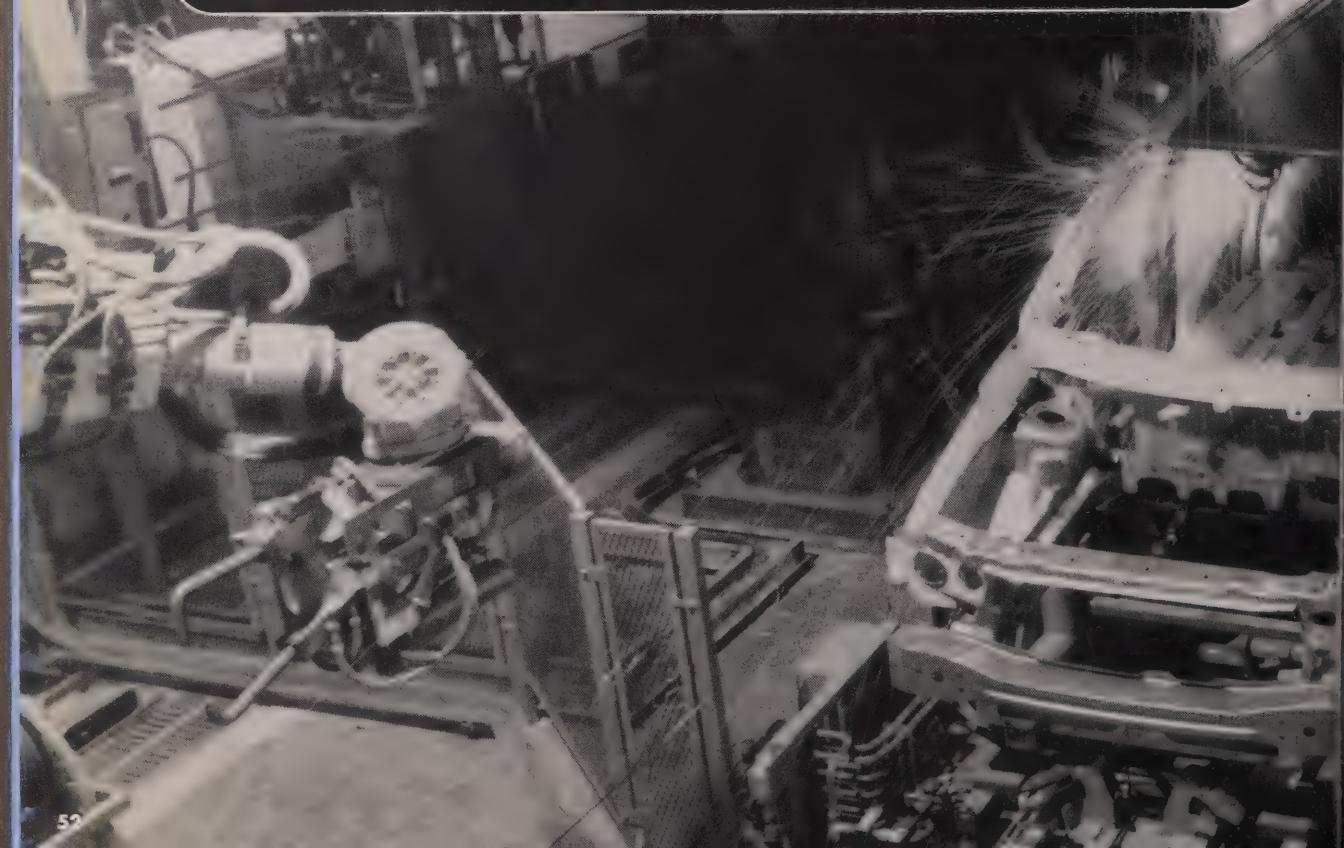
As an essential part of the solution to reduce greenhouse gases, Canadian industry has embraced the challenge—industry sector by industry sector. Innovative ideas and creative thinking have led companies down many different paths from re-engineering to team problem-solving tactics. The benefits are tangible—lower production costs and work force stability—measurable advances against our yardstick of greater efficiency per unit of output. The following success stories highlight solid gains in a number of sectors as a result of the process.



Employee involvement and education is the key success factor for many energy efficiency innovations. And sharing successful energy efficiency innovations is the key element in achieving performance gains. The "big 3" members, Chrysler, Ford and General Motors, and other companies working together, sponsor major, semi-annual Energy Management and Energy Education and Awareness conferences, workshops and seminars. These feature well-known speakers on a variety of energy management ideas and techniques. Attendance is excellent with up to 100 industry people attending each conference. Each event features a careful, focused agenda on energy efficiency actions.

The conference also provides an opportunity to update attendees on the Industrial Energy Innovators program, the Voluntary Challenge and Registry Program, and climate change issues. The wide range of energy efficiency topics, issues addressed, demonstrations and displays are used as a template by other industrial sectors in planning similar conferences.

Important support is provided by technology suppliers, major energy utilities and provincial government ministries.



Transportation Sector Energy Task Force Meets Energy Management Challenge

Through these conferences, the transportation sector has found an innovative way to involve energy managers in discussions and exchange of ideas and experiences. The energy efficiency ideas and methodologies presented in the workshops and seminars following the conferences provide a more interactive forum where specific topics, such as lighting retrofits, can be reviewed in more detail and are followed by a tour of an actual facility where a lighting project has been carried out.

ENERGY CONFERENCE OBJECTIVES:

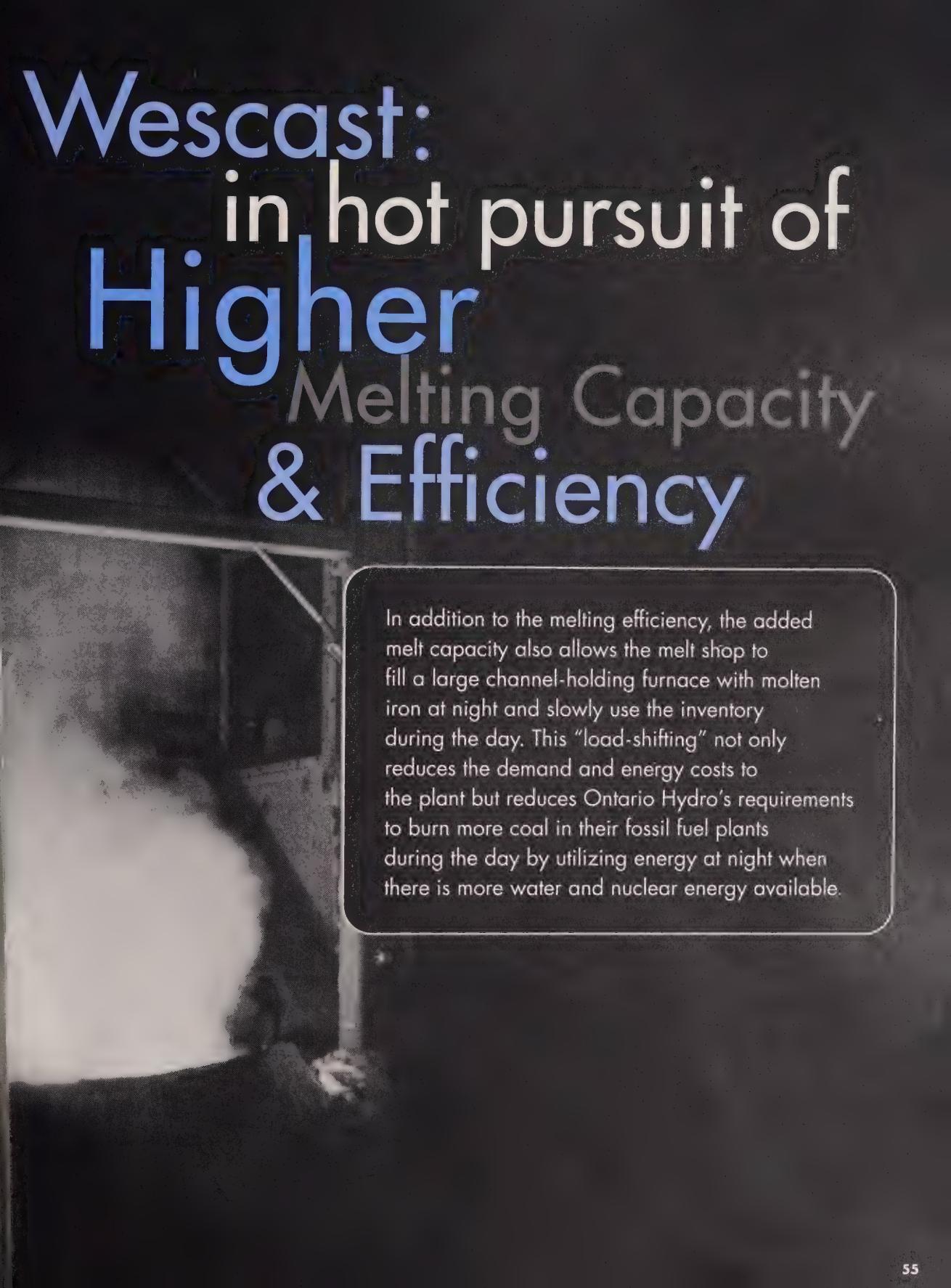
- Encourage audit and control of utility resources
- Link energy management to your strategic business objectives
- Learn from successful case studies
- Gain competitive advantage
- Reduce costs and leverage resources

When the Brantford casting plant of Wescast Industries decided to expand the melt shop capacity, careful consideration was given to equipment selection. The three existing coreless induction furnaces produced 3000 kW of melting power at 60 Hz and could melt iron at a rate of 4 to 5 tons per hr. The two new furnaces installed over the last two years produce 5000 kw of melting power at 200 Hz and can melt iron at a rate of 8 to 9 tons/hr. The higher frequency of these furnaces allows the scrap charge to couple more quickly with the induced magnetic flux and the melting operation becomes more efficient. Monitoring the furnaces over a three-month period resulted in the following data:

(kWh/ton)

Power	Frequency		Avg	Std Dev
	kW	Hz		
#1 furnace	3000	60	599	83
#2 furnace	3000	60	574	104
#3 furnace	3000	60	597	108
#4 furnace	5000	200	473	75
#5 furnace	5000	200	480	90

Wescast: in hot pursuit of **Higher** Melting Capacity & Efficiency



In addition to the melting efficiency, the added melt capacity also allows the melt shop to fill a large channel-holding furnace with molten iron at night and slowly use the inventory during the day. This "load-shifting" not only reduces the demand and energy costs to the plant but reduces Ontario Hydro's requirements to burn more coal in their fossil fuel plants during the day by utilizing energy at night when there is more water and nuclear energy available.

When Canada's aluminum companies think about energy leadership, Aluminerie L'auralco Inc., in Deschambault, Quebec is top of mind. Akin to the plot of a good Sherlock Holmes novel, employees are energy efficient sleuths. The greatest challenge faced by L'auralco is to push beyond the obvious areas of energy savings to seek out even greater efficiency improvements.

L'auralco's plant located about 80 km west of Quebec City along the north shore of the St. Lawrence River, produces 230,000 metric tonnes of aluminum per annum.

To consume less energy, to achieve greater efficiency and to reduce greenhouse gases, Aluminerie L'auralco employees had to overcome two challenges. First, they had to realize that despite using state-of-the-art technology and an optimized working environment, there is still room for worthwhile improvements. Second, the management organization had to match energy efficiency objectives.

Aluminerie L'auralco has decided to conscientiously optimize energy and implement rigorous measures throughout the whole plant. They've formed working teams representing each of the areas of the plant: carbon, electrolysis, cast house, maintenance and engineering, and environment. A facilitator guides employee groups through energy savings problem-solving exercises and ensures that every step required to reach the best solutions is respected.





Optimize, Implement and Facilitate — Plant-wide at Aluminerie Luralco

In addition to the best technology, the human side of energy efficiency is taken very seriously. Each work area is harmonized toward a common energy savings objective. Upper management supports the steps and means toward the achievement of specific goals. And, most importantly, Aluminerie Luralco employees have adopted a well-proven approach which consists of prioritizing projects according to "better chance of success" selection criteria—rather than being tempted to use return on investment as a sole criterion. This provides team motivation. The results?

By monitoring usage of available energy, electricity and natural gas, and by setting well-thought through objectives, Aluminerie Luralco has been achieving impressive gains. Their cost of production is lower because energy savings have allowed improvements in profitability. For example, over the one-year period ending February 1997, reduced energy consumption per metric tonne of aluminum produced an average of 13.5 mWh per tonne, down from 14.0 mWh per tonne. They have increased production capacity without increasing energy consumption. And by being energy efficient, Luralco is able to reduce greenhouse gases.

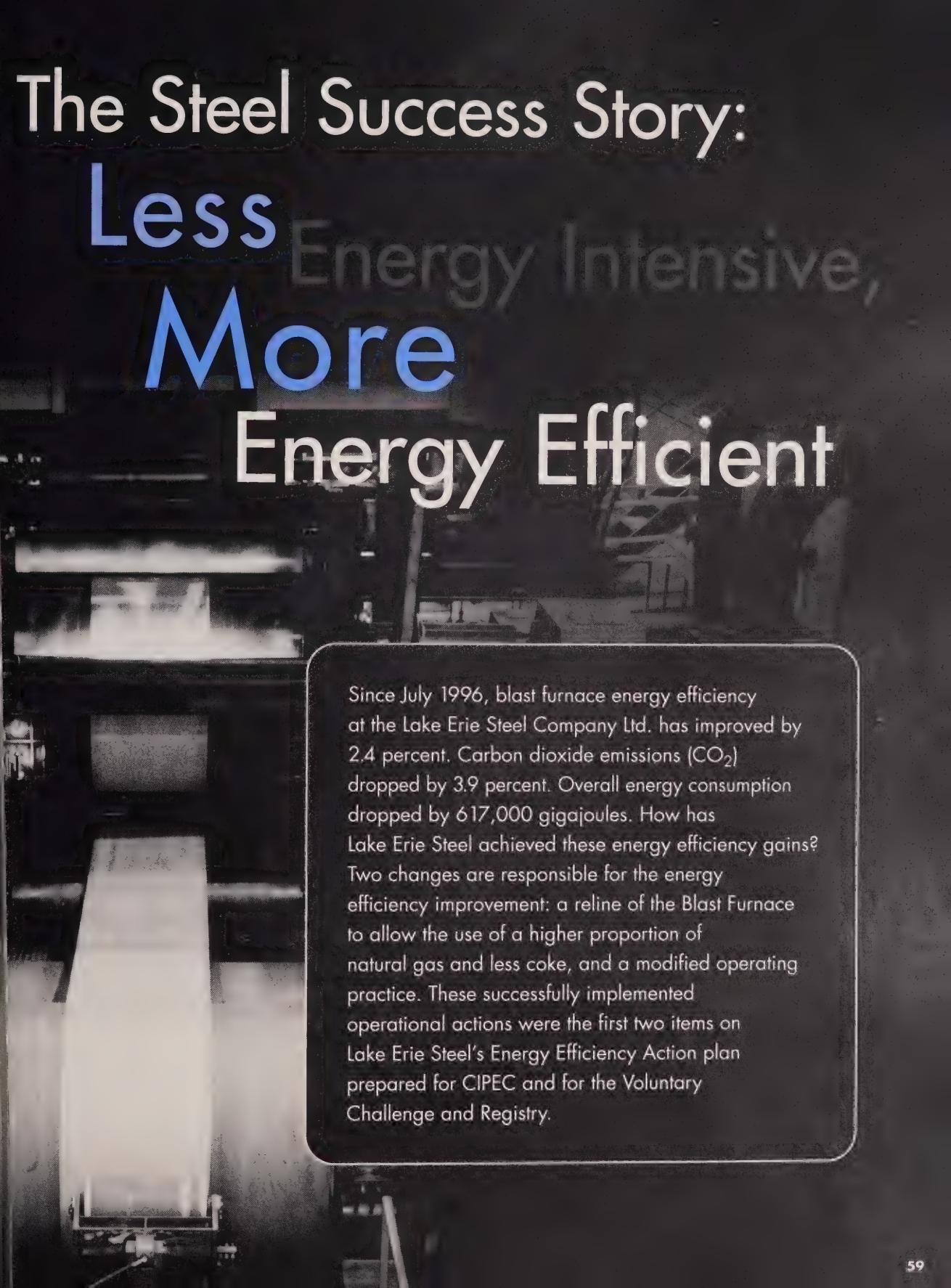
In 1997, Canada's steel companies strengthened their energy efficiency performance. The Algoma Steel plant in Sault Ste. Marie started a thin slab caster process. This is the first example of this type of less energy intensive technology in Canada.

The start-up of its electric arc furnace (EAF) steelmaking and continuous casting facility in late 1996 is allowing Dofasco to replace one-third of its 1990 steelmaking capacity. The electric arc furnace is a 100 percent scrap-based technology and as a result uses well over 50 percent less energy than steel made from basic oxygen furnaces (BOF) supported by blast furnace/coke plant operations.

In 1996, CHT Steel replaced mercury vapour fixtures with metal halide units and reduced electricity consumption for lighting by 50 percent. This housekeeping measure saved the company \$35,000 per annum. The upgrade increased the lighting level at the mill floor from 7 to 30 lumens while at the same time decreasing the fixture count from 325 to 168.



The Steel Success Story: Less Energy Intensive, More Energy Efficient



Since July 1996, blast furnace energy efficiency at the Lake Erie Steel Company Ltd. has improved by 2.4 percent. Carbon dioxide emissions (CO_2) dropped by 3.9 percent. Overall energy consumption dropped by 617,000 gigajoules. How has Lake Erie Steel achieved these energy efficiency gains? Two changes are responsible for the energy efficiency improvement: a reline of the Blast Furnace to allow the use of a higher proportion of natural gas and less coke, and a modified operating practice. These successfully implemented operational actions were the first two items on Lake Erie Steel's Energy Efficiency Action plan prepared for CIPEC and for the Voluntary Challenge and Registry.

Shell Canada is seeing big financial returns from energy efficiency improvements.

Shell Canada's downstream energy efficiency in 1996 improved by 1.8 percent over 1995, 2.8 percent over 1994, and 9.9 percent over 1990. Their progress has made a significant contribution to the Canadian Petroleum Products Industry (CPPI) commitment of reducing its Energy Intensity Index by 1 percent per annum from 1995 to 2000.

In 1997, a major heat integration project was completed at the Sarnia Refinery Crude Unit. The project cost was approximately \$20 million. These significant modifications are expected to reduce fired and electrical costs by more than \$2 million per annum—an excellent return on this energy efficiency investment.

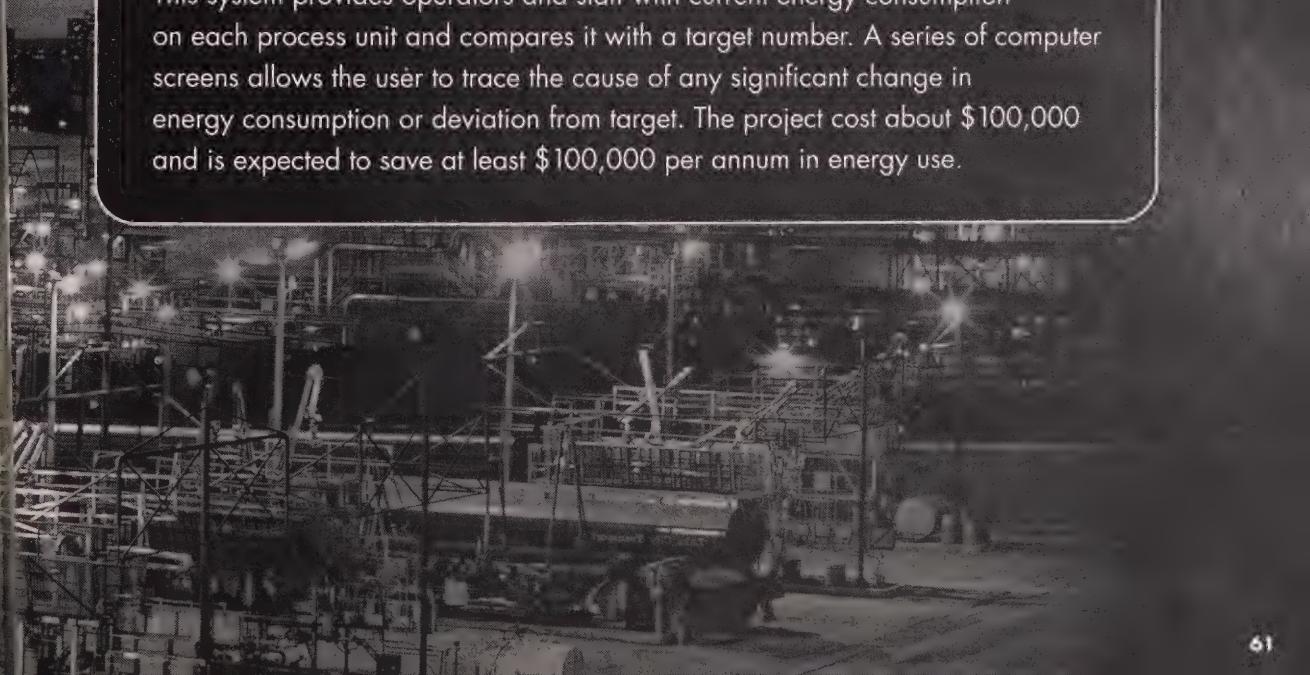
At Shell's Montreal East Refinery, extensive modifications were made to the Fluid Catalytic Cracking unit in 1996 to improve heat integration and utilization. Modifications included a new steam generator, an additional reboiler, and a new feed preheater. The project cost \$4.2 million and will save about \$1 million per annum in fuel and electricity. Also, controls were added to six steam turbines to allow for variable speed control. These modifications significantly reduce steam consumption and resulting generation of excess low pressure steam. The modifications are similar to variable-speed drives on electric motors but are considerably less expensive. The project cost approximately \$100,000 and will save about \$270,000 per annum in fired fuel.



Energy Efficiency Improvements Make Good Financial Sense at Shell Canada

At the Sarnia Refinery, a new heat exchanger was added to the hydrocracking unit to recover heat from the reactor effluent stream. The recovered heat will be used to reduce fuel use in a downstream reboiler furnace. The project cost about \$750,000 and will save about \$300,000 per annum in fired fuel.

At the Scotford Refinery, an on-line energy monitoring system was completed. This system provides operators and staff with current energy consumption on each process unit and compares it with a target number. A series of computer screens allows the user to trace the cause of any significant change in energy consumption or deviation from target. The project cost about \$100,000 and is expected to save at least \$100,000 per annum in energy use.



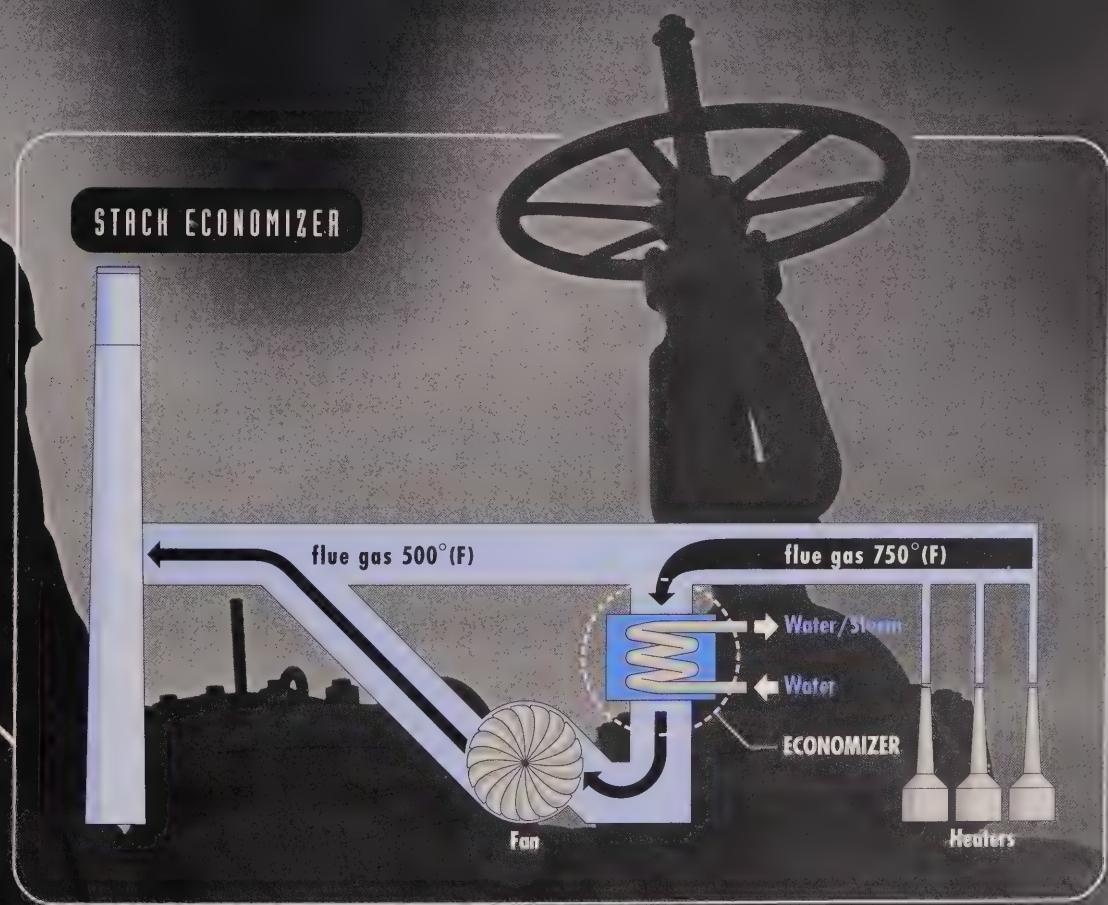
In April 1997, Sunoco Refinery (a Suncor Energy Company) initiated operation of an economizer to capture heat from flue gas heaters. The flue gas was being emitted to the atmosphere at 750°F. After installation, the economizer process cooled the flue gas with water to 500°F. Part of the water leaving the economizer is vaporized to a high pressure steam by-product and then used in refinery processes. Using this steam by-product reduces the amount of steam existing boilers must produce and the fuel required for the process.

Use of the Stack Economizer has resulted in:

- Carbon dioxide (CO₂) emissions reduction of approximately 20,000 tonnes per annum
- Energy cost savings of approximately \$1 million per annum



Stack Economizer: A Million-Dollar Energy Saver at Sunoco



Knowing "how" to achieve energy efficiency is an essential step toward achieving energy efficiency. This year the CIPEC Rubber Manufacturing Industry Task Force and the Rubber Association of Canada researched and analyzed opportunities that allowed Canada's rubber manufacturers to become more energy efficient. The result is an industry guide, *Energy Efficiency Opportunities in the Canadian Rubber Industry*.

For the first time, all of Canada's rubber manufacturers have standardized industry information to help them identify energy efficiencies within their facilities and processes. The goal of the guidebook is to show rubber companies how to reduce energy costs and audit their energy efficiency. To introduce and promote the guidebook, the Rubber Association conducted an Energy Efficiency Workshop where energy efficiency techniques were explained and sound energy management principles were offered.



Education by Design Furthering Canadian Rubber Industry in Energy Efficiency Opportunities and Innovations

Used rubber tires represent both a recycling and energy efficiency opportunity. To take advantage of this opportunity, the rubber industry promotes rubber recycling as both an energy and cost saving measure. The success of this promotion and the guidebook are reflected in the Bi-Annual Rubber Recycling Trade Show developed, managed and hosted by the Rubber Association of Canada. Planning is in progress for Rubber Recycling '98 to be held in Toronto in October 1998. The recycling trade show is a major North American initiative. It is enthusiastically attended by entrepreneurs and industry people from around the world looking for innovative uses for scrap rubber.

INNOVATORS BY SECTOR

The Industrial Energy Innovators Initiative focuses on transforming the sector-level commitments made by the task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level. As of December 31, 1997, 243 manufacturing and mining companies representing over 75 percent of industrial energy use have signed on as Industrial Energy Innovators. The majority of these companies are participants in the Climate Change Voluntary Challenge and Registry program.

Aluminum

Alcan Aluminium Ltd.
Aluminuminerie Alouette inc.
Aluminerie de Bécancour Inc.
Aluminerie Luralco Inc.
Société Canadienne de Métaux
Reynolds Limitée

Cement

ESSROC Canada Inc.
Inland Cement
LaFarge Canada Inc.
North Star Cement Ltd.
St. Lawrence Cement Inc.
St. Marys Cement Corporation
Tilbury Cement Ltd.

Chemicals

DuPont Canada Inc.
Harcos Pigments Canada
MDS Nordin
Nacan Products Limited
Synergistics Industries Limited

Electrical/Electronics

Ascolelectric Ltd.
Broan Limited
Honeywell Limited
IBM
Northern Telecom Limited
Osram Sylvania Ltd.
Vansco Electronics Ltd.

Food and Beverage

Andrés Wines Ltd.
Casco Inc.
Coca-Cola Beverages (n-vcr)
Cuddy Food Products
Garden Province Meats Inc.
H.J. Heinz Company of Canada
Hub Meat Packers Ltd. – Sunrise Brand
Kraft Canada
Labatt Breweries of Canada
Maple Leaf Meats
Maple Leaf Pork
Maple Lodge Farms Ltd.
Molson Breweries
Moosehead Breweries Ltd.
Pepsi-Cola Canada Beverages
Sleeman Brewing & Malting Co. Ltd.
Sun-Rype Products Ltd.

General Manufacturing

3M Canada Inc.
ABCO Property Management Inc.
Block Drug Company (Canada) Ltd.
Canadian Uniform Limited
Champion Feed Services Ltd.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
Duracell Canada Inc.
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Euclid-Hitachi Heavy Equipment Ltd.
Federated Co-operatives Ltd.
Garland Commercial Ranges Ltd.
Gould Shawmut Company
Greif Containers Inc.
Huls Canada Inc.
Imperial Tobacco Limited
Imperial Wallcoverings (Canada) Inc.
Ingram & Bell Inc.
Interface Flooring Systems (Canada) Ltd.
International Paper Industries Ltd.
Johnson Wax
Jones Packaging Inc.
Kindred Industries
Kodak Canada Inc.
LePage
Maksteel Service Centre
Marcel Lauzon Inc.
Meridian Clemmer Industries Ltd.
Metroland Printing, Publishing & Distributing
Morton International Ltd.
Polytainers Inc.
PRO-ECO Limited
Regent Eco Canada
Renfrew Tape Limited
Simmons Canada Inc.
Starcan Corporation
Superior Radiant Products Ltd.
Tamrock Canada Ltd.
Tamrock Loaders
Teknion Furniture Systems
VicWest Steel
Viskase Canada Inc.
Wabash Alloys Ontario
Wescast Industries Inc.
Wyeth-Ayerst Canada Inc.

Steel

Algoma Steel Inc.
 AltaSteel Ltd.
 Atlas Specialty Steels
 CHT Steel Company
 Co-Steel LASCO
 Dofasco Inc.
 Frost Wire Products Ltd.
 Gerdau Courtice Steel Inc.
 Ivaco Inc.
 Lake Erie Steel Company Ltd.
 Laurel Steel – a division of Harris Steel Limited
 QIT – Fer et Titane inc.
 Slater Steels HSB Division
 Stelco Fasteners Ltd
 Stelco Hilton Works
 Stelco Inc.
 Stelco-McMaster Ltée
 Stelfil Ltée
 Stelpipe Ltd
 Stelwire Ltd.
 Sydney Steel Corporation
 Welland Pipe Ltd

Lime

Chemical Lime Company of Canada
 Continental Lime Ltd.
 Global Stone Ingersoll Ltd.
 Graybec Calcium Inc.
 Havelock Lime – a division of Goldcorp, Inc.

Potash

Potash Corp. of Saskatchewan Inc.
 – Allan Division
 – Cory Division
 – Lanigan Division
 – New Brunswick Division
 – Patience Lake Division
 – Rocanville Division

Mining

Aur Resources
 Barrick Gold Corporation – La Mine Doyon
 BHP Diamonds Inc.
 Brunswick Mining & Smelting Corporation Ltd.
 (Noranda Mining and Exploration Inc.
 – Brunswick Mining Division)
 Brunswick Smelting and Fertilizer
 Cominco Ltd.
 Echo Bay Mines Ltd. – Lupin Operation
 Falconbridge Ltd.
 Fonderie Horne-Noranda
 Hemlo Gold Mines Inc.

Hillsborough Resources Limited
 Hudson Bay Mining and Smelting Co. Ltd.
 INCO Limited
 International Minerals & Chemicals (Canada)
 Global Limited (IMC Kalium)
 Iron Ore Company of Canada
 Mines et exploration Noranda Inc.
 – Division Matagami
 Mines Wabush (gérées par la Compagnie
 Minière Cliffs inc.)
 Noranda Metallurgy Inc.
 (Canadian Copper Refinery)
 Placer Dome Canada Limited
 Quebec Cartier Mining Company
 Syncrude Canada Ltd.
 Teck Corporation
 Westmin Resources Limited
 Zinc Électrolytique du Canada Limitée
 – Canadian Electrolytic Zinc Limited

Pulp and Paper

Abitibi-Consolidated Inc.
 Aenor Inc.
 Canfor Corporation
 Cariboo Pulp and Paper Company Limited
 Cascades Paperboard International Inc.
 Donohue Quno Inc.
 E.B. Eddy Forest Products
 Eurocan Pulp & Paper Co.
 F.F. Soucy Inc.
 Fletcher Challenge Canada Limited
 Fort James-Marathon Ltd.
 James MacLaren Industries Inc.
 Kruger Inc.
 Lake Utopia Paper
 Macmillan Bloedel Limited
 Maritime Paper Products Ltd.
 Noranda Forest
 Repap Enterprises Inc.
 Spruce Falls Inc.
 St. Marys Paper Inc.
 Stora Forest Industries Limited
 Tembec Inc.
 Weldwood of Canada Limited
 West Fraser Timber Co. Ltd.
 Weyerhaeuser Canada

Petroleum Products

Amoco
Canadian Tire Petroleum
Chevron Canada Ltd./Burnaby Refinery
Husky Oil Corporation
Imperial Oil
Interprovincial Pipe Line Inc.
Irving Oil Limited
Nova Corporation
Parkland Refinery Ltd.
Petro-Canada Inc.
Safety-Kleen
Shell Canada Limited
Suncor – Sunoco Group
Ultramar Canada Inc.

Plastics

Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.

Rubber

Gates Canada Inc.
Michelin North America
NRI Industries Inc. (formerly – National Rubber)

Textiles

Agmont Inc.
Albarrie Canada Limited
Britex Group (The)
C.S. Brooks Corporation
Cambridge Towel Corporation (The)
Canada Cordage Inc.
Canada Hair Cloth Co. Limited
Coats Bell
Coats Patons
Collingwood Fabrics Inc.
Collins & Aikman
Consoltex Group Ltd.
Cookshire Tex
Dominion Speciality Yarns
Dominion Textile Inc.
Fabrene Inc.
Glendale Yarns Inc. or Glendale Spinning Mills (1981) Ltd.
J.L. de Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Nova Scotia Textiles, Limited
Peerless (LA CORPORATION DES TAPIS PEERLESS)
Spinrite Inc.
Stewart Group Limited (The)

Union Felt Products

Vagden Mills Limited
Velcro Canada Inc.
Vitafoam Products Canada Ltd.
Weavexx

Transportation

Accuride Canada Inc.
AlliedSignal Aerospace Canada
Altek Automotive Castings
Bombardier Inc.
Cami Automotive Inc.
Canadian General-Tower Limited
Chrysler Canada Ltd.
Eaton Corporation – Suspension Division
Ford Motor Company of Canada Limited
Freightliner of Canada Ltd.
General Motors of Canada Ltd.
Kelsey Hayes Canada Ltd.
Magna Corp.– Cosma Body & Chassis Systems
McDonnell Douglas Canada Ltd.
Navistar International Corporation Canada
Oetiker Limited (n-vcr)
Orenda Aerospace Corp.
(formerly: Hawker Siddeley Canada Inc.)
Orion Bus Industries Ltd.
Polywheels Manufacturing Limited
Pratt & Whitney Canada Inc.
Prévost Car Inc.
Rockwell International
Russel Metals Inc.
Toyota Motor Manufacturing Canada Inc.
Volvo Canada Ltd.
Woodbridge Group

Higher Heating Value The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called gross calorific value or gross heating value).

Lower Heating Value The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen the higher and lower heating values are the same (also called the net heating value or the lower calorific value).

Energy Intensity Indicator A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Intensity

Energy consumption per unit of output

Physical Energy Intensity

Energy consumption per unit of physical output

Economic Energy Intensity

Energy consumption per unit of economic output

Energy Performance Measures

Any of a variety of metrics that would indicate an aspect of energy performance

Specific Energy (Consumption)

Energy consumption per physical unit of output (also called physical energy intensity)

Tier 1 Informal designation by CIPEC of industries that are major energy consuming industries. The seven designated Tier 1 industries are Pulp & Paper, Petroleum Refining, Cement, Mining, Steel, Chemicals and Aluminum. The Tier 1 industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II Informal designation by CIPEC of industries that are minor energy consuming industries (relative to Tier 1 industries) but contribute substantially to Canadian industrial GDP. The Tier II industries account for 60 percent of Canadian industrial GDP.

Greenhouse Gas (GHG) A greenhouse gas absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main greenhouse gases are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxides (N_2O). By far the most abundant greenhouse gas is CO_2 , accounting for 70 percent of the greenhouse effect.

Natural Resources Canada (NRCan) As the predominant natural resource department of the federal government, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources, and to develop an understanding of Canada's land mass.

Framework Convention on Climate Change

(FCCC): United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing greenhouse gas emissions at 1990 levels by the year 2000.

Gross Domestic Output (GDP): The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1986 dollars.

Climate Change Voluntary Challenge and Registry Program (VCR):

The VCR is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce greenhouse gas emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce greenhouse gases from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Energy Innovators Initiative provides a means for manufacturing and mining companies to enroll in the VCR.

Statistics Canada (Stats Can): Statistics Canada is the country's national statistical agency, with programs organized into three broad subject matter areas: demographic and social, socio-economic and economic. Under the Statistics Act, Statistics Canada is required to collect, compile, analyze, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Standard Industrial Classification (SIC):

Statistics Canada uses a classification system that categorizes establishments into groups with similar economic activities.

CO₂: A compound of carbon and oxygen which in its normal gaseous state is clear and colourless. CO₂ is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions not involving combustion.

Embodied Energy The energy consumed to transform all upstream raw materials into the final product; in a life cycle approach it would be the "cradle-to-gate" energy burden.

Base Year A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Annual Census of Mines: Natural Resources Canada survey which collects information on SIC 06 and SIC 08.

Annual Survey of Manufacturers (ASM): Statistics Canada survey. Provides information on the Consumption of Purchased Fuels and Electricity (CPFE) for approximately 230 subsectors at four-digit SIC code levels.

Industrial Consumption of Energy Survey (ICE): Statistics Canada survey on energy use. Covers purchased and nonpurchased energy for approximately 24 industrial subsectors.

Quarterly Report on Energy Supply and Demand (QRESD): Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are mainly gathered by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

The Canadian Pulp and Paper Association
The Canadian Petroleum Products Institute
The Canadian Chemical Producers' Association
The Canadian Fertilizer Institute
The Mining Association of Canada
The Canadian Steel Producers Association
The Canadian Foundry Association
The Aluminum Industry Association
The Canadian Portland Cement Association
The Canadian Lime Institute
The Ontario Food Processors Association
The National Dairy Council
The Alliance of Manufacturers
and Exporters Canada (AEC)
 The AEC Ontario Division
 The AEC Alberta Division
 The AEC Newfoundland Division
 The AEC Nova Scotia Division
 The AEC New Brunswick Division
 The AEC Manitoba Division
 The AEC British Columbia Division
 The AEC Prince Edward Island Division
The Aero Space Industries Association of Canada
The Canadian Vehicle Manufacturers' Association
The Automotive Parts Manufacturers' Association
The Council of Forest Industries
The Canadian Plastics Industry Association
The Canadian Textiles Institute
The Rubber Association of Canada
The Electro-Federation of Canada
The Canadian Gas Association



CIPEC

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canadian industry program for energy conservation
1997/1998 annual report





Office of Energy Efficiency
Office de l'efficacité énergétique

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

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Our mission

To promote effective voluntary action which reduces industrial energy use per unit of production, thereby enhancing economic performance, while participating in meeting Canada's carbon dioxide stabilization objectives.

1997/1998 CIPEC ANNUAL REPORT

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Chairman's letter

The Honourable Ralph Goodale
Minister of Natural Resources Canada
Ottawa, Ontario K1A 0A6

Dear Minister,

I am pleased to present CIPEC's 1997/98 Annual Report.

This year's edition builds upon our previous accomplishments and once again demonstrates the commitment of Canadian manufacturing and mining industries to the efficient utilization of energy within their businesses. Significantly, these results have taken place under a voluntary context and during a time of significant economic growth.

Over the past year, CIPEC has endeavoured to broaden and deepen company participation as Industrial Energy Innovators in the Climate Change Voluntary Challenge and Registry (VCR) Inc. This has been achieved through a program of awareness and recognition and the development of specific tools to remove barriers to the implementation of energy efficiency projects within companies.

CIPEC continues to be a key element for the manufacturing and mining sectors' response to Canada's National Action Program on Climate Change. Over the past year, CIPEC participants have also responded to your call for assistance in the development of a post-Kyoto climate change response. Our reach is also spreading. This year, we have grown to 21 task forces from within our network of 30 trade associations representing over 3000 companies and approximately 90 percent of secondary industrial energy demand in Canada.

Programs under the auspices of CIPEC are yielding positive results. Voluntary action has helped participants achieve an average annual energy intensity improvement of 0.9 percent for the years 1990 to 1997. Significantly, there has been an average annual improvement of 2.0 percent for the years 1991 to 1997. Data provided by Natural Resources Canada (NRCan) indicates that energy-use-related carbon dioxide emissions have increased by just 0.5 percent for the years 1990 to 1997, indicating virtual emissions stabilization.

In March of 1998, it was my privilege to become Chair of the CIPEC Executive Board. I have been truly impressed with the quality and sincerity of the commitment of CIPEC's many participants. On behalf of CIPEC, I thank you for NRCan's continuing support. Your commitment to programs such as CIPEC has helped spawn a climate for true sustainable development as well as demonstrating the effectiveness of government/industry voluntary partnerships.

I look forward to working with you in the future.



Peter Cooke
Chair, CIPEC Executive Board

Executive overview

Highlight Success Stories

Companies participating in the Canadian Industry Program for Energy Conservation (CIPEC) are proud of the role they are playing in CIPEC's growing success. These organizations are demonstrating day-in and day-out that when companies take individual action on energy efficiency, they can make a substantial difference to our environment.

In this Annual Report, we highlight the efforts of just a few of the many CIPEC participants who are making innovative changes to improve the effectiveness of energy use within their organizations. Through energy efficiency, fuel switching and fuel shifting, Canada's manufacturing and mining sectors continue to make advances, and in the process, to enhance their competitiveness. These efforts are making a valuable contribution to the country's progress in meeting its international climate change commitments.

Continued CIPEC Improvement in Energy Intensity

CIPEC's success is built on the voluntary efforts of Canadian manufacturing and mining industries. Their enthusiastic commitment to improve energy intensity goes hand-in-hand with a sound strategic business plan, and reflects a belief that working together, industry can voluntarily improve its energy effectiveness.

Programs under the auspices of CIPEC and participating trade associations are yielding positive results. CIPEC's continuing annual average improvement in energy intensity of 0.9 percent from the 1990 base year to 1997 is on track with our target of 1.0 percent per year (Figure 1). Our average annual energy

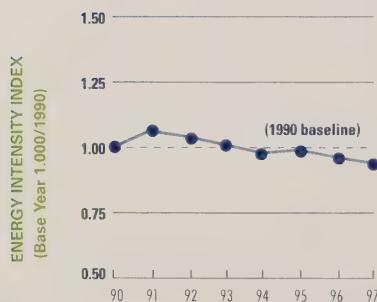


Figure 1
CIPEC Energy Intensity Index



Figure 2
CIPEC Economic Growth

intensity improvement of 2.0 percent from 1991 to 1997 is significantly better (Figure 1). During the period 1990 to 1997, CIPEC economic growth was 17.2 percent overall, which represents an average annual growth of 2.3 percent (Figure 2).

Equally important, investments and efforts to improve energy use have also helped participating companies reduce costs and improve profitability, vital components of every successful enterprise's business strategy. These companies have shown that responsible environmental action is not necessarily an expense, but can be a significant contributor to the bottom line.

Our System and Process

CIPEC is an umbrella organization that oversees a highly successful partnership between government and private industry, a relationship that will celebrate its silver anniversary in the year 2000. This extraordinary partnership is successful because it is built on cooperation and trust.

CIPEC's role is to promote positive change and to identify and reward the leaders driving that change. We encourage progress through a strong awareness program built on our twice-monthly *Heads Up* newsletter and regular features in selected trade magazines. Using these media, we celebrate industry leaders and their energy efficiency innovations and we offer ideas that can improve business and economic benefits through reductions in energy use.

Many CIPEC volunteers are successful business leaders, individuals with strong leadership abilities who have received significant national awards. These qualities, combined with a strong belief in the ability of business to make voluntary changes without government regulations, make these leaders most effective in attracting new industry participants and in nurturing the successful partnership between industry and government. Under their leadership, companies participating in CIPEC have made important voluntary contributions toward Canada's goal of reducing the production of greenhouse gases by improving energy efficiency.

To support private sector efforts, CIPEC has initiated a number of activities that encourage the full involvement of Canadian industry and raise awareness of the goals and benefits of improved energy efficiency. These activities include:

- regular sector task force meetings in which energy-efficiency-related information is exchanged
- energy forums to enable sectors to share ideas and information
- support for energy management seminars sponsored by Natural Resources Canada's (NRCan's) Office of Energy Efficiency
- the development of individual sector leadership nuclei capable of expanding CIPEC participation within the sector
- the creation of communication programs that bolster public and industry awareness of the activities and achievements of CIPEC industries
- participation in energy efficiency benchmarking and other activities initiated by the Office of Energy Efficiency

CIPEC continues to be the focal point for the manufacturing and mining response to Canada's National Action Program on Climate Change. Our network includes 30 trade associations representing over 3000 companies, and our reach is spreading. By the end of 1997, we had grown to 21 Task Forces representing a broad spectrum of enterprises.

CIPEC provides a role model for stable government/business partnerships in Canada and is building a growing international reputation. CIPEC is currently fielding inquiries from other nations as well as business and industry in countries around the world.

Canadian Industry Energy End-Use Database and Analysis Centre (CIEEDAC)

Through their task forces, individual CIPEC sectors are actively working to improve the quality of the data used to measure their energy intensity performance. Accurate and consistent methods of measuring output and energy use by various sectors are essential to quantifying CIPEC's ongoing success in promoting effective energy management. Equally important is the accuracy of the data collected by Statistics Canada and the methods used to report it to the Canadian Industry Energy End-Use Database and Analysis Centre (CIEEDAC) at Simon Fraser University in British Columbia. CIEEDAC analyses this data to define sector fuel sources and to produce sector energy intensity indicators based on production and GDP.

The cooperative CIEEDAC system is internationally recognized for its methods, data integrity and relationship with CIPEC, and several other countries have expressed interest in learning more about both organizations. Primary funding for CIEEDAC comes from CIPEC and NRCan, with additional contributions provided by industry associations and the Province of Quebec.

There remains some concern about the accuracy of data reported to Statistics Canada and, in some cases, about the aggregation or disaggregation of industries gathered within certain Standard Industry Classifications. CIPEC Task Forces and the sectors, in collaboration with CIEEDAC, and Statistics Canada are addressing these concerns.

Collaboration with the Voluntary Challenge and Registry (VCR) Inc.

The Industrial Energy Innovators Initiative focuses on transforming the sector-level commitments made by the Task Forces into company-level action by helping to overcome obstacles to energy efficiency. As of December 31, 1998, 249 companies representing over 75 percent of industrial energy use have signed on as Industrial Energy Innovators. The majority of these companies are participants in the Climate Change Voluntary Challenge and Registry (VCR) Inc.

Over the past year, CIPEC has broadened and deepened individual participation by Industrial Energy Innovators in the VCR Inc. through various initiatives. These initiatives include the creation of programs to increase awareness of the economic benefits of improved energy use and the development of specific tools that remove barriers to the implementation of energy management projects within companies. Our collaboration with the VCR Inc. has also resulted in the development of innovative programs within individual sectors.

Energy Related CO₂

The voluntary actions of CIPEC sectors are focused on energy intensity improvements, thereby controlling and reducing energy-based carbon dioxide (CO₂) emissions. Since 1990, despite a strongly expanding economy, more effective energy use has enabled CIPEC companies to limit related CO₂ emissions to a minor increase of 0.5 percent (Figure 3). Our aggregate energy-based CO₂ emissions are essentially stabilized at 1990 levels (Figure 3).

Future Directions

During the past year, CIPEC sector task forces have been evaluating the targets established at Kyoto for reducing greenhouse gas emissions through the year 2010. In addition, they are developing post-Kyoto climate change responses and actions for their sectors. Several sector task forces (including pulp and paper, food processing, general manufacturing, steel, transportation manufacturing, mining, and petroleum refining) are actively pursuing climate change issues through the Forestry, Agriculture-Agri Food, and Industry Issue Tables of the National Climate Change Implementation Strategy. Some sectors have prepared foundation papers and subsequent options developments. Individual sector representatives participating in the Industry Table are building CIPEC's image and promoting its spirit of cooperation and partnership to others.

Future directions for CIPEC participants include furthering the switch from carbon-intensive to non-carbon-intensive fuels, pursuing improvements in the effectiveness of energy use, and, most notably in the pulp and paper and wood sectors, switching from other fuels to biomass.

All sectors continue to recruit additional company members as Industrial Energy Innovators and participants in the VCR Inc. to encourage energy management and to promote employee training on the benefits of improved energy intensity.

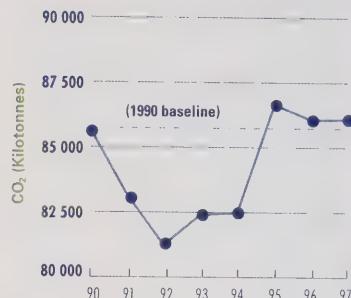


Figure 3

Energy Related CO₂



canadian industry program for energy conservation
success stories



Innovation in action

When it comes to energy efficiency in the Canadian manufacturing and mining industries, one thing is clear: volunteerism works. Since 1990, companies participating in the Canadian Industry Program for Energy Conservation (CIPEC) have made important voluntary contributions toward our nation's goals of decreasing energy intensity and reducing the production of greenhouse gases. Between 1991 and 1997, Canada's mining and manufacturing companies improved their average annual energy intensity by 2.0 percent. Since 1990, despite a strongly expanding economy, better use of energy has enabled these companies to limit related carbon dioxide (CO₂) emissions to a marginal increase of less than 0.5 percent.

Equally important, investments and efforts designed to improve energy efficiency have also helped participating companies reduce costs and improve profitability—vital components of every successful enterprise's business strategy. Their achievements demonstrate that responsible environmental action can significantly improve the bottom line.

The following stories profile the efforts of 12 CIPEC members to reduce the energy intensity of their operations. These forward-looking organizations are only a sampling of the more than 240 manufacturing and mining companies that have joined Natural Resources Canada's (NRCan's) Industrial Energy Innovators Initiative. Their approaches—and successes—represent the impressive results being achieved across Canada through voluntary participation. CIPEC members, such as the companies featured here, demonstrate day-in and day-out that hundreds of companies taking individual action can have a substantial, positive impact on our environment and make a vital contribution to Canada's success in meeting its international commitments.



Agrium Inc.:

finding fertile ground
for **energy saving**



Agrum Inc. is serious about energy efficiency. Agrum is one of North America's largest producers of nitrogen, ammonia and phosphorus fertilizers, with eight plants in Canada and the U.S. Its Canadian plants at Joffre and Cardston in Alberta, and at Fort Saskatchewan and Redwater in Saskatchewan, are world-scale facilities operating in the lowest energy quartile in North America.

A major reason for the operational excellence of its plants is Agrum's insistence that energy efficiency be a key criteria in the design of each facility. For example, the company has undertaken a \$10 million energy efficiency retrofit of the Ammonia 1 plant at its flagship Redwater fertilizer facility. In addition, recent capital improvements at the plant have led to better ammonia nitrate anti-caking performance and significantly reduced nitrous oxide emissions. A 1996 urea "de-bottleneck" project and high on-stream performance has enabled the facility to set new annual production records. At Joffre, northeast of Red Deer, the company produces anhydrous ammonia using by-product hydrogen and nitrogen from neighbouring plants as a feedstock. This reduces energy costs and has made the plant one of the most energy-efficient ammonia production facilities in North America. Joffre consumes only 23 Mmbtus per short tonne of ammonia produced compared to an industry average of 34 Mmbtus, and a western Canada average of 30 Mmbtus.

Agrum believes that as an environmental steward, the company must strive to reduce emissions at the same time it seeks to increase production. The company takes seriously its commitment to provide the healthiest environment possible for its employees, their families and their communities.



Amalgamated Dairies Ltd.:

milking energy savings
in the dairy industry



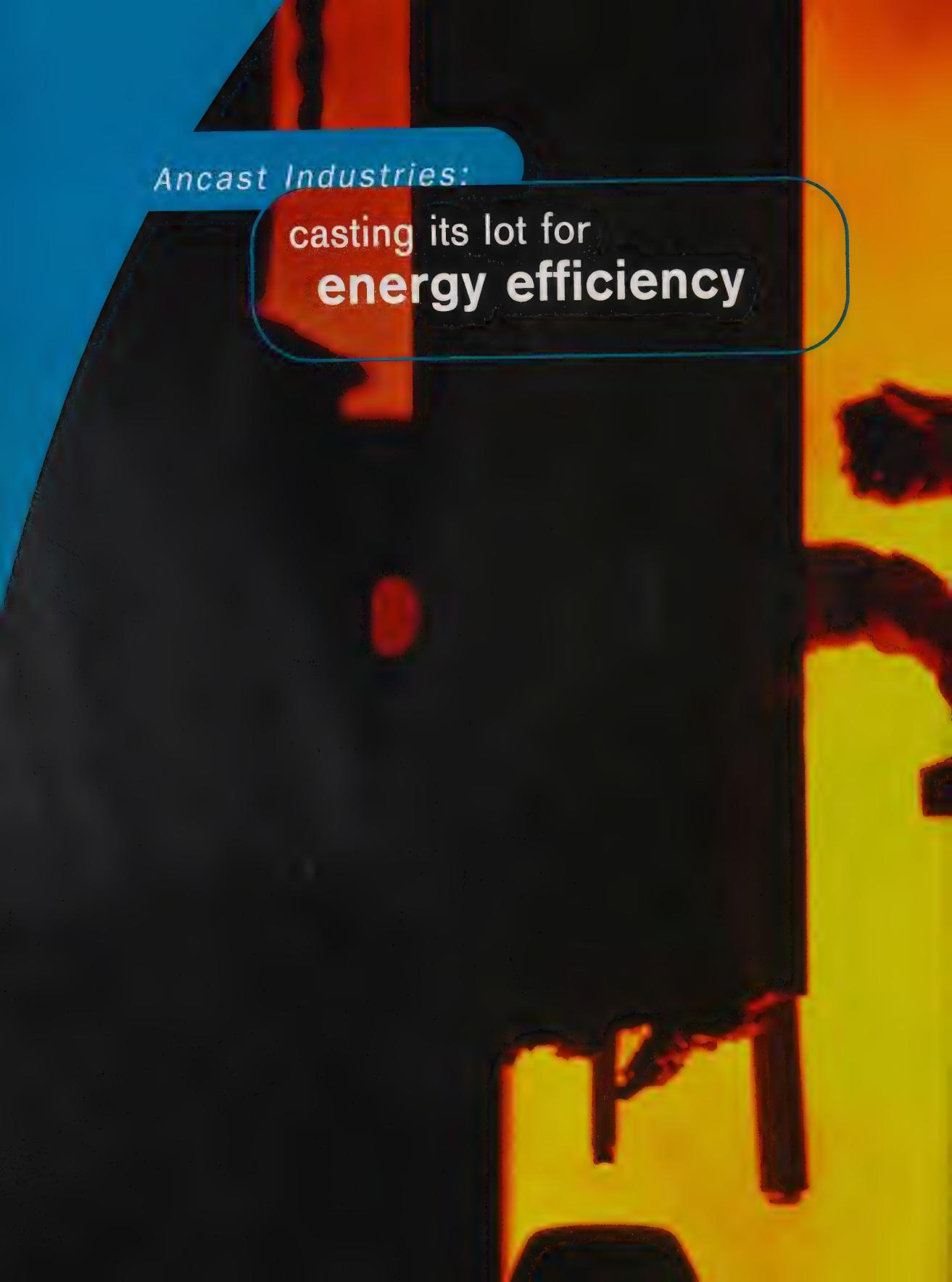
The cost of electricity in Prince Edward Island is among the highest in Canada, and Amalgamated Dairies Ltd. knows that saving energy can have a major impact on its cost of operations. That's one of the key reasons why the province's leading dairy has made energy efficiency and the reduction of greenhouse gas emissions integral to the company's philosophy.

Since 1994, Amalgamated has actively pursued energy savings at its 10 facilities across the province. The company installed new capacitor banks at its thermal processing, fluid milk, and cheese and ice cream plants. With a payback of three years, the capacitor banks correct the power factor and enable better use of electricity. Their installation alone has reduced electricity consumption by 5%.

Also in the cheese and ice cream facility, the company installed motion detector lighting to ensure that lighting is on only when needed, further reducing electricity consumption.

Amalgamated Dairies has also undertaken measures to reduce heating costs. For example, the company designed its frozen food distribution centre to incorporate a waste heat regeneration system. The process heat created at the plant is captured and used to heat the facility.

Incorporating attention to energy saving into its operating practices has enabled Amalgamated Dairies to claim its place as an industry leader in energy efficiency and innovation.



Ancast Industries:

casting its lot for
energy efficiency



The metal casting industry is all about high temperatures, and creating heat takes massive amounts of energy. Back in the early 1990s, Winnipeg's Ancast Industries decided to find ways to reduce its energy consumption footprint.

The company started by committing itself to purchase only high efficiency electric motors. It followed with an ongoing program to install energy-efficient metal halide lighting, and began converting from less efficient compressed air devices to electric tools and hoists.

In 1995, the purchase of a new 3,000 kW glycol-cooled closed loop melting furnace cut electricity consumption by as much as 10% per tonne of metal melted while substantially reducing water consumption. To improve office heating efficiency, the company replaced steam boilers with gas fired unit heaters.

Recently, Ancast purchased cold box core machines to replace four natural gas-fired machines. The company was able to eliminate gas heating torches by installing enclosed ladles for ductile iron treatment and proprietary refractory ladle lining shells. The new ladle enables molten iron to be tapped at temperatures 50°F cooler than previously possible.

Ancast has found that its decision to incorporate energy efficiency factors in the process of selecting new technology, equipment and processes has led to substantial cost savings and contributed significantly to the company's ongoing success and growth.



Crestbrook Forest:

**cooperation, creativity
and co-generation**



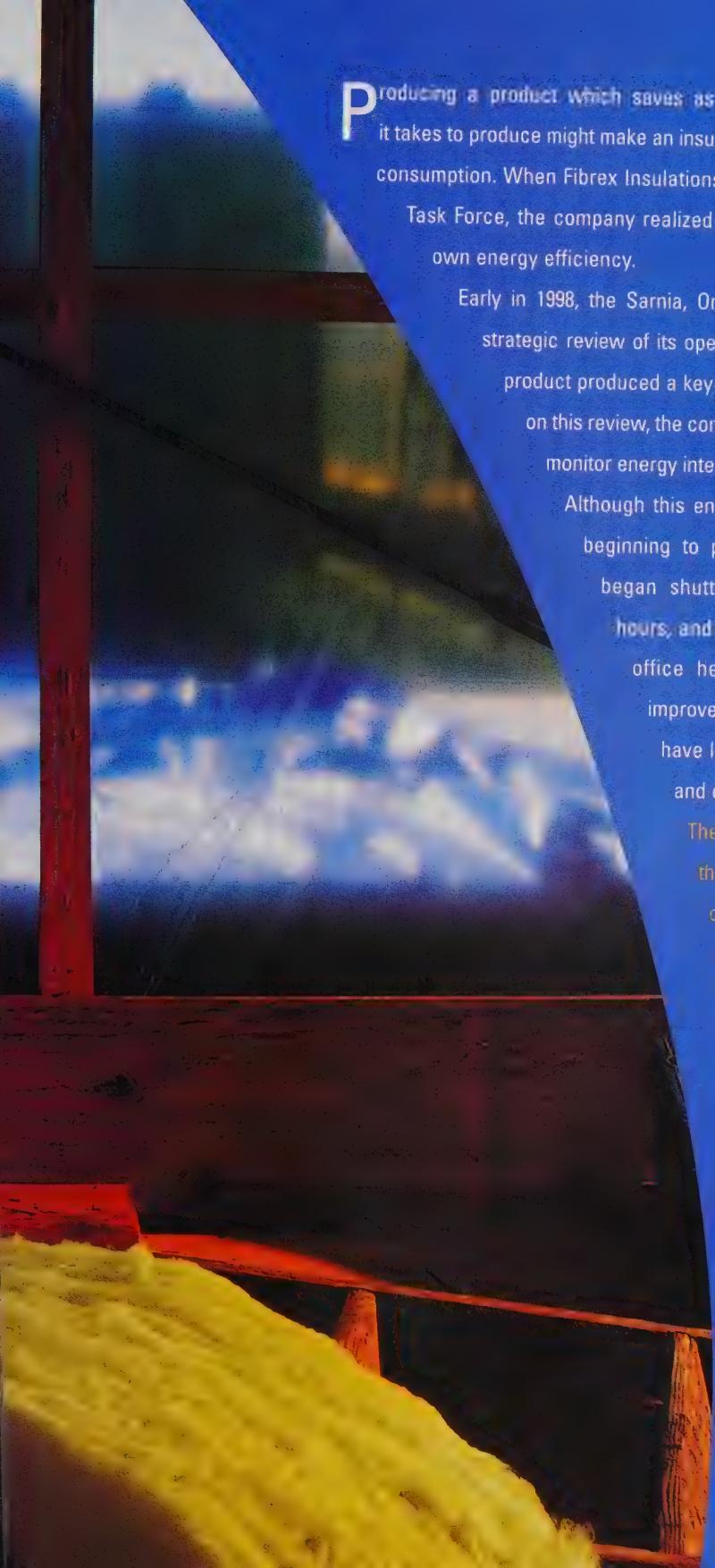
You don't have to be an industry giant to find ways to make substantial gains in energy efficiency. As Crestbrook Forest has demonstrated, a little creativity and cooperation can go a long way.

The company has launched a unique power generation project at its Skeakumchuck, British Columbia pulp mill in conjunction with Purcell Power and Stothert Power Corporation. Purcell is building a \$40 million co-generation power plant that will be fueled by wood waste mainly from Crestbrook's East Kamsukay sawmills. A mothballed recovery boiler will be recommissioned and used to produce steam to power a new turbine generator. A state-of-the-art electrostatic precipitator will clean exhaust gases to meet government standards.

When the new generator begins operating in early 2000, the 15 MW of power it produces will be sold to B.C. Hydro. The wood-fired system will enable Purcell Power to shut down a gas-fired boiler, thereby substantially reducing greenhouse gas emissions and cutting natural gas consumption by as much as half. The co-generation project will reduce maintenance costs and improve reliability. Purcell Power estimates that maintenance savings alone will pay for the project.

Fibrex Insulations Inc.:

saving energy
on an energy-saving product



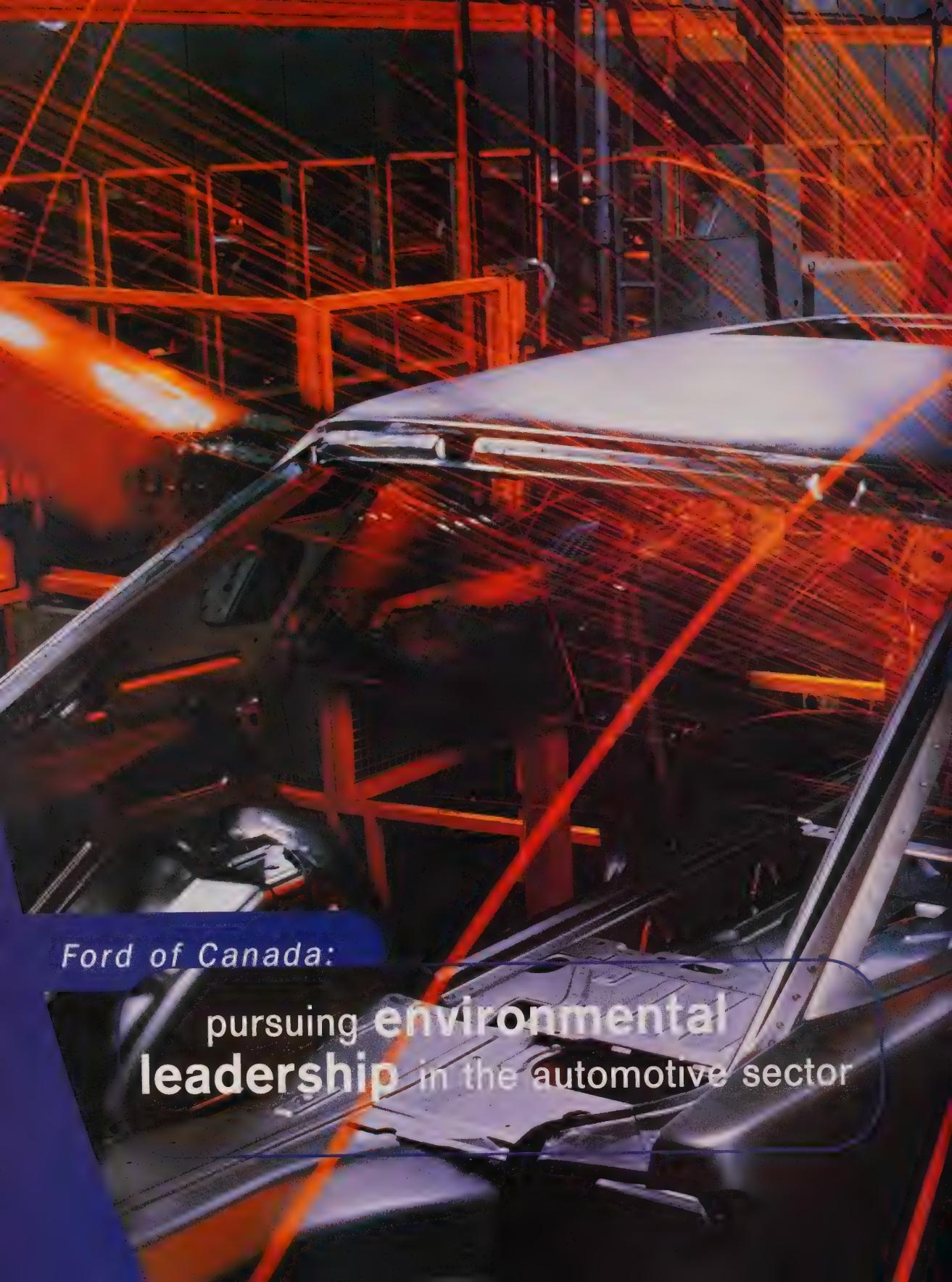
Producing a product which saves as much energy in its first month of use as it takes to produce might make an insulation manufacturer complacent about energy consumption. When Fibrex Insulations Inc. joined CIPEC's General Manufacturing Task Force, the company realized there was room to significantly improve its own energy efficiency.

Early in 1998, the Sarnia, Ontario-based company launched a complete strategic review of its operations, and made energy cost per pound of product produced a key manufacturing performance indicator. Based on this review, the company implemented a measurement system to monitor energy intensity, and focused its efforts to save energy.

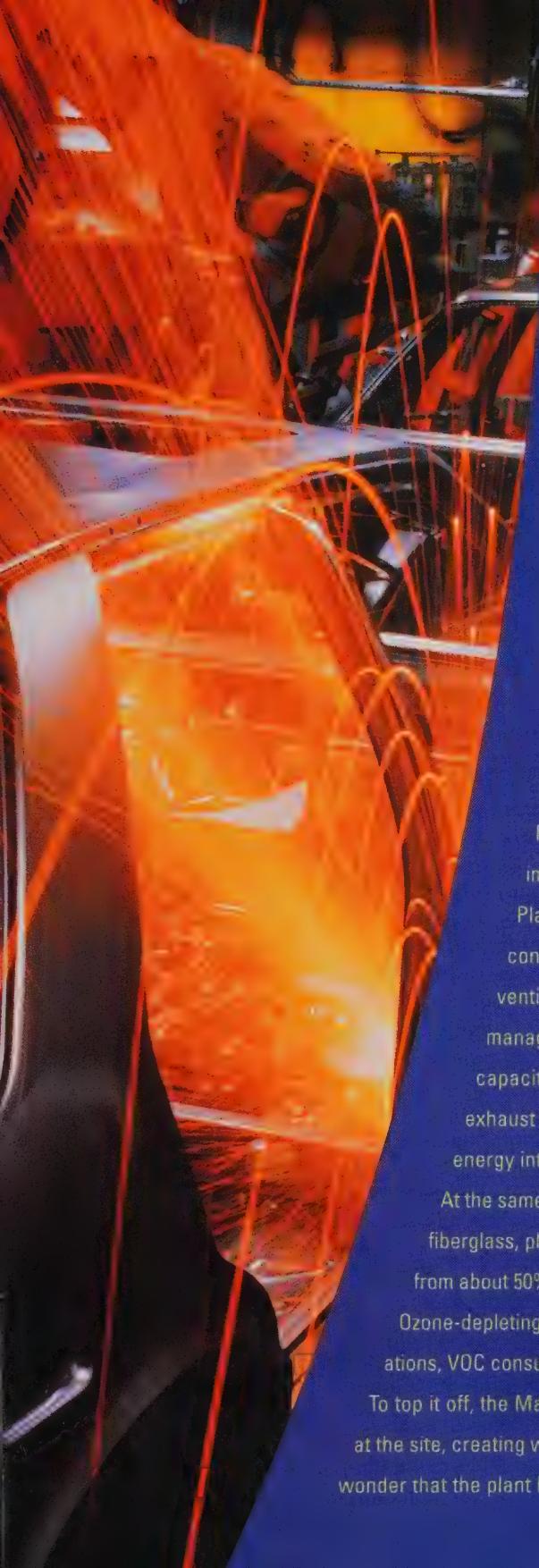
Although this energy initiative is in its infancy, it is already beginning to pay dividends. For example, the company began shutting down warehouse lighting during off hours, and installed set back thermometers to control office heating. These, and other steps taken to improve the energy efficiency of process equipment, have led to notable reductions in both natural gas and electricity use.

The most significant energy savings have come through improvements to the plant's coke-fired cupola. Through consistent measurement, reporting and careful process control, Fibrex has reduced coke consumption per pound of mineral fibre produced by one fifth since 1993. At the same time, production has increased to yield a saving in coke of more than 2 million kilograms compared to 1993 levels.

Thanks to its renewed focus on energy efficiency, Fibrex is not only producing a product which saves energy, it is saving energy while doing it.



Ford of Canada:
pursuing environmental
leadership in the automotive sector



Ford of Canada is a Canadian industrial giant by any standard. Supporting its diverse array of manufacturing activities takes vast quantities of energy of all kinds. It is not surprising, then, that the company is ceaselessly pursuing ways to reduce energy consumption and the impact of its operations on the environment. The drive for environmental excellence led the company's Oakville Assembly Plant and Markham Electronics Plant to become the first in their respective North American industries to receive ISO 14001 registration, the international industrial environmental standard.

The quest for greater control over power consumption motivated Ford to install a comprehensive, computerized power monitoring and management system at the Oakville plant that provides end-to-end monitoring of the 50 MVA site. The system enables the plant to study power usage patterns on an area-by-area basis and introduce improvements where they will have the greatest benefit.

Perhaps nowhere in the company are its environmental improvements more apparent than at the Markham Electronics Plant. Since 1992, the company has introduced automated lighting controls and more energy-efficient fixtures, retrofitted its heating, ventilation and air conditioning system (HVAC) to enable central management and control, reduced cooling water circulating pump capacity, and made improvements to its air dryer, compressed air and exhaust fan systems among other projects. These efforts have reduced energy intensity by more than 20%.

At the same time, the plant has launched innovative recycling programs for fiberglass, plastic and food wastes that have helped boost its recycling rate from about 50% to nearly 80%, and reduced waste management costs by 50%.

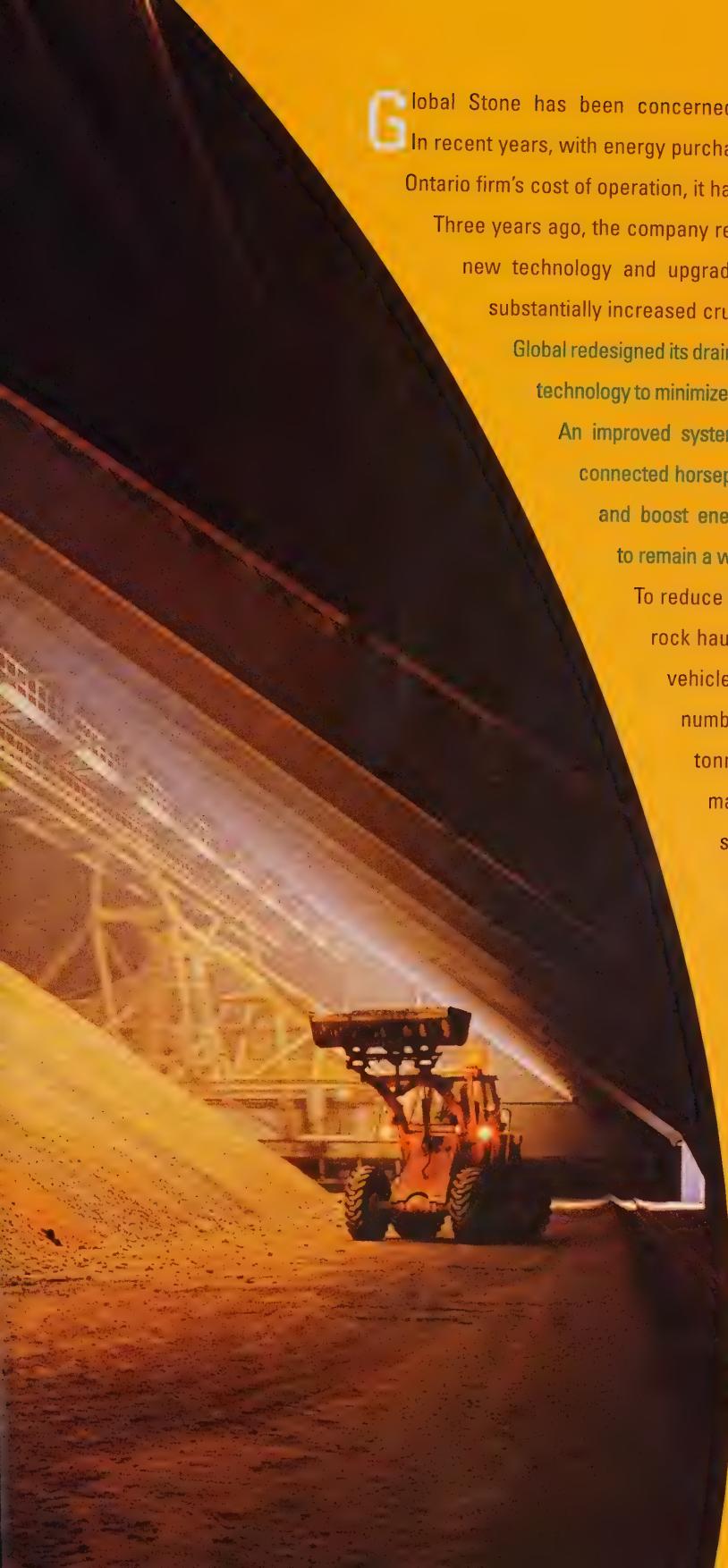
Ozone-depleting substances have been eliminated from all manufacturing operations, VOC consumption slashed by 65% and lead waste reduced by 95%.

To top it off, the Markham plant has begun a program to enhance wildlife habitat at the site, creating wild flower gardens and providing nesting sites for birds. It's no wonder that the plant has won the Canadian Award For Business Excellence.



Global Stones

end-to-end
energy efficiency



Global Stone has been concerned about energy efficiency for decades. In recent years, with energy purchases making up about 35% of the Ingersoll, Ontario firm's cost of operation, it has become a top priority.

Three years ago, the company replaced its primary rock crushing unit with new technology and upgraded surrounding lighting. These changes substantially increased crusher throughput per kilowatt hour.

Global redesigned its drainage control system around the best available technology to minimize the number of pumps and improve efficiency.

An improved system design enabled the company to reduce connected horsepower by 26%, improve system effectiveness and boost energy efficiency while helping the company to remain a world leader in outflow water purity.

To reduce the use of diesel fuel, Global upgraded its rock haul fleet to newer, larger and more efficient vehicles enabling the company to reduce the number of trucks while increasing its annual tonnage by 50%. More efficient blasting machinery and methods quadrupled boring speed, improved fragmentation and reduced energy consumption.

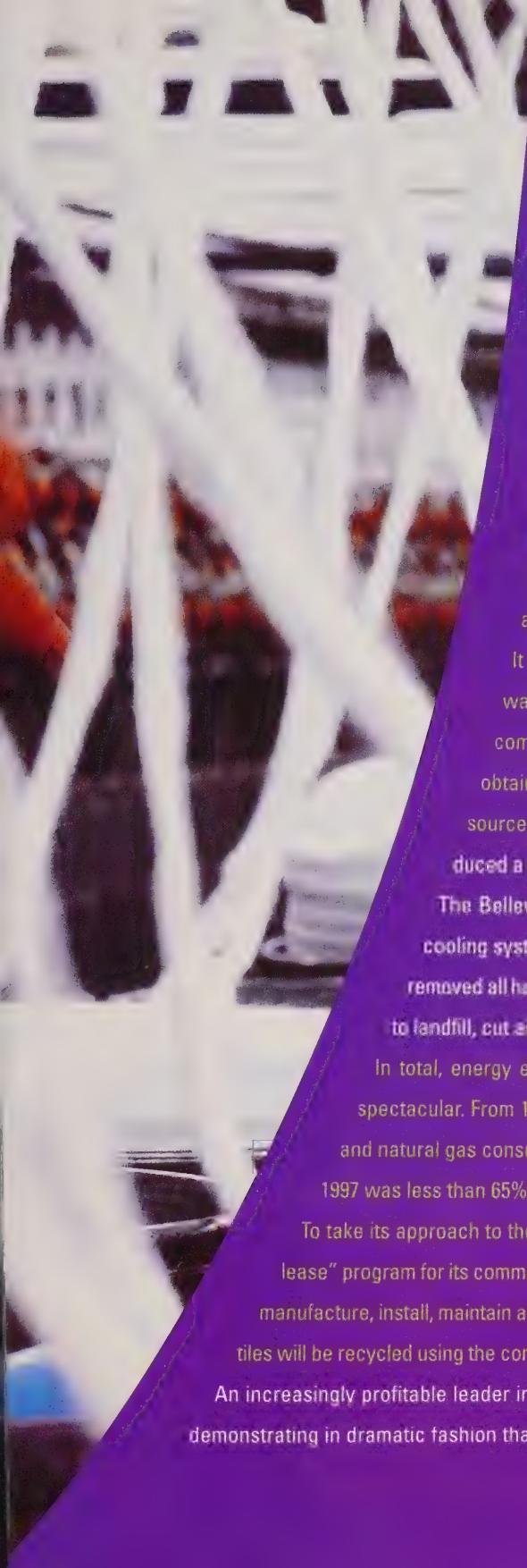
Kilns were expanded and up-graded to eliminate loading shutdowns and enable the continuous feeding of limestone. This improved efficiency, saved heat and increased throughput.

Thanks to its focus on reducing waste and a commitment to make sensible, ongoing investments in energy savings, Global Stone will continue to be an industry energy efficiency leader.

A color photograph of a man with glasses and a mustache, wearing a purple shirt, smiling while working in a carpet manufacturing plant. He is surrounded by industrial equipment and piles of dark-colored carpeting. The lighting is dramatic, with strong highlights and shadows.

Interface, Inc.:

**doing well
by doing good**



Interface, Inc. has a bold mission: to put back more than it takes from the earth. Its motto is: "Doing well by doing good."

The company is the world's largest manufacturer of commercial carpeting, operating 26 manufacturing facilities around the world, including a Canadian plant in Belleville, Ontario. The Belleville plant has taken the company's mission to heart and begun making significant improvements in virtually every area of its operations to save energy. It improved lighting, equipment and motor efficiencies, and launched new preventive maintenance and compressed air programs. Throughout the facility, programs to manage thermostats, heat and air conditioning based on energy efficiency were set up.

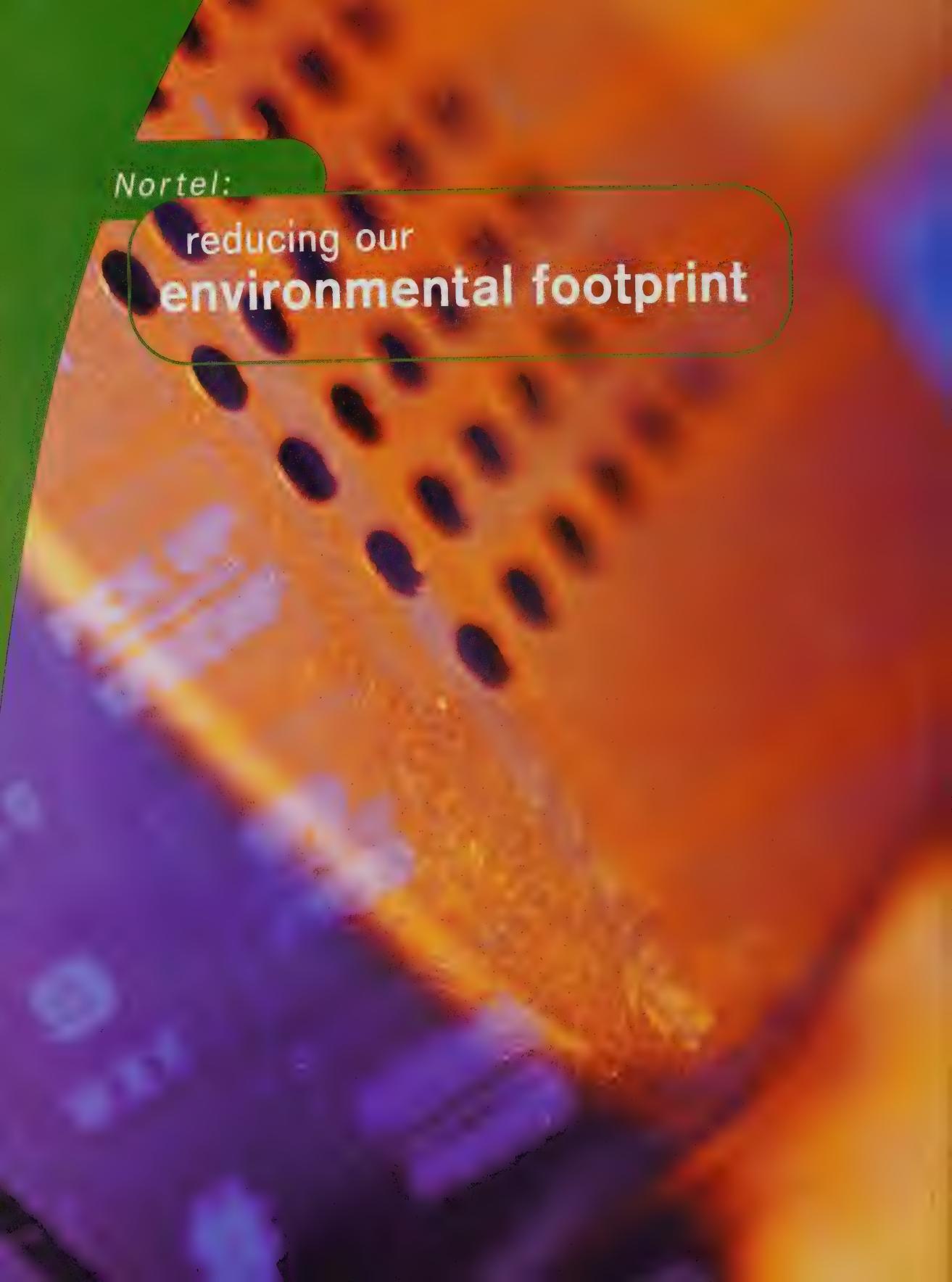
The plant charted process energy consumption, and began managing each piece of equipment for efficiency and energy savings. It found ways to lower the process fusing temperature and capture waste process heat to warm the building. Interface was the first company in Canada to agree to purchase green energy, and now obtains about 25% of its power consumption from certified green sources. To drive home the importance of energy efficiency, the plant introduced a company-funded home energy savings program for employees.

The Belleville plant has eliminated all discharges of water by replacing its cooling system and changing the way it puts patterns into its products. It also removed all heavy metals from manufacturing processes, slashed the waste going to landfill, cut air emissions by 38% and reduced off-gassing from carpets by 94%.

In total, energy efficiency improvements at Interface's Belleville plant have been spectacular. From 1995 to 1997, electricity used per unit of production was cut in half and natural gas consumption dropped by nearly two thirds. Total power consumption in 1997 was less than 65% that of 1993 despite a 58% increase in production.

To take its approach to the next level, Interface plans to introduce an innovative "perpetual lease" program for its commercial flooring products. Under this program, the company hopes to manufacture, install, maintain and, at the end of their life cycle, remove worn out carpet tiles. Spent tiles will be recycled using the company's own sources of green energy from wind and solar sources.

An increasingly profitable leader in its industry, Interface is a major force for positive change. It is demonstrating in dramatic fashion that doing the right thing can be very good for business.



Nortel:

reducing our
environmental footprint



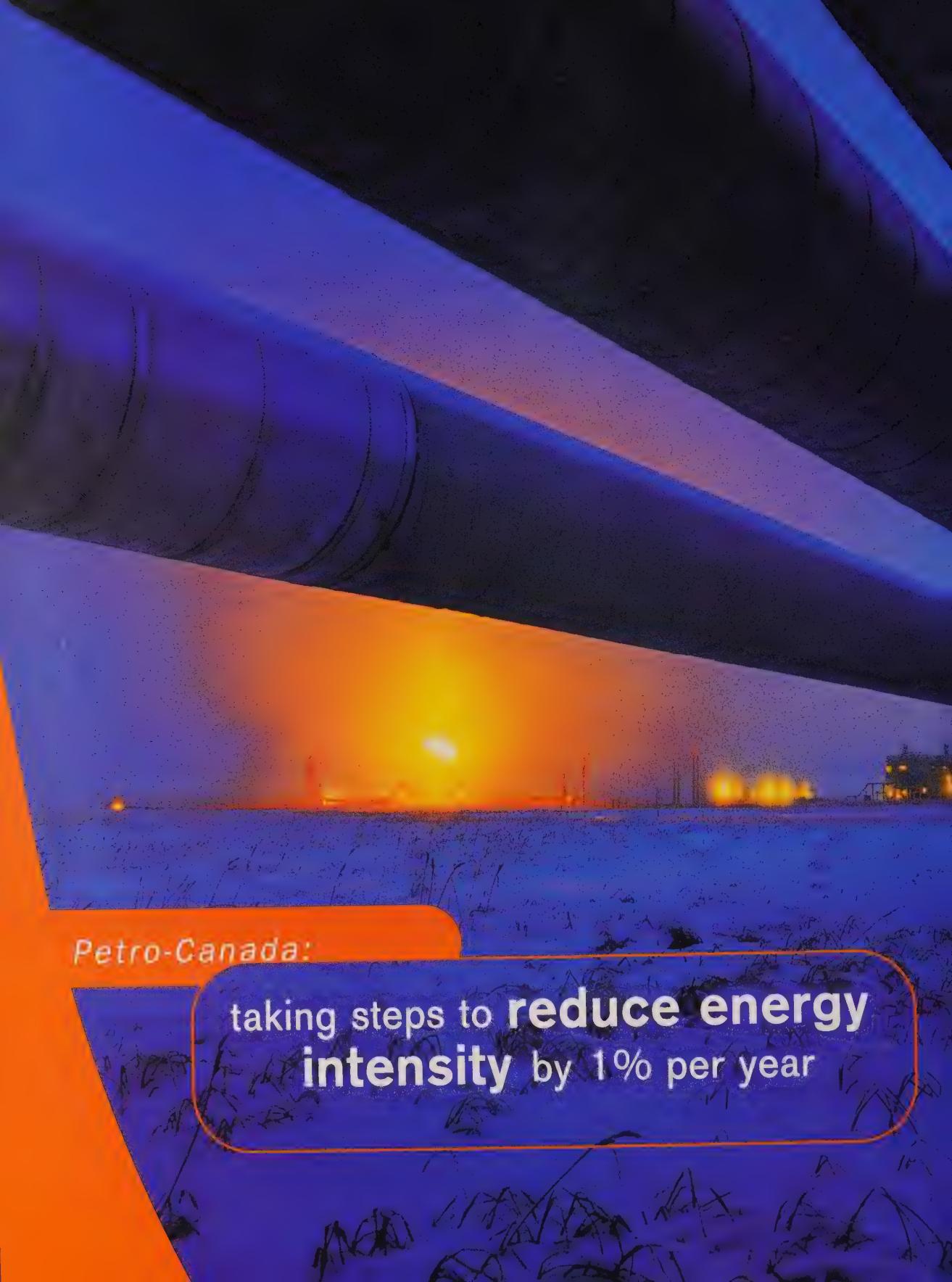
Nortel (Northern Telecom) is taking an exceptionally broad look at the way its business affects energy consumption and greenhouse gas emissions. While focused on ensuring its manufacturing operations are eco-efficient, the company has broadened its concerns to look at the way its products and business practices promote sustainability.

Nortel communication network products, by providing widespread access to experience, ideas and knowledge, enhance information exchange while minimizing the need for the transportation of people and goods. By nature, these products reduce energy consumption, but Nortel isn't content with this contribution to energy saving alone. The company is continuing to pursue technological developments which enable it to produce products which are both smaller and more powerful—reducing the energy component in its products, while augmenting the energy saving abilities of this technology.

Within its operations, an extensive telecommuting program, HOMEbase, enables more than 3,500 Nortel employees to work from home offices throughout North America and the U.K. This program decreases greenhouse gas emissions an estimated 7.5 million kilograms per year, while boosting employee job satisfaction. The company has also introduced "Travel Less" and "Frequent Flyer Trees" programs to promote the reduction of business travel.

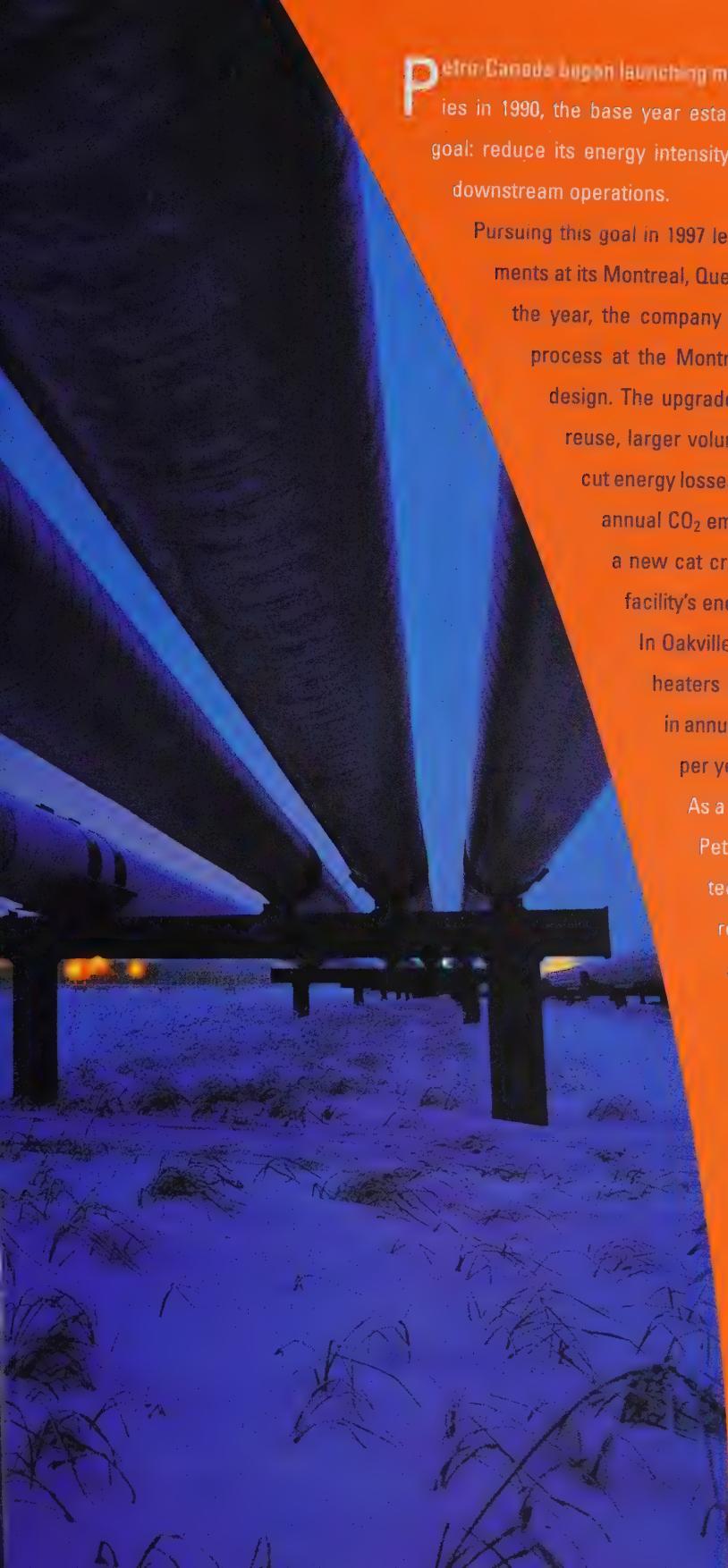
Financed by the savings they create, infrastructure projects at the company's Corkstown and Belleville, Ontario sites have been put in place to reduce both energy consumption and greenhouse gas emissions.

Nortel believes that putting environmental ideas into action is part of the company's legacy. Long-term sustainability requires the company to broaden its horizons and widen its scope of action. Shrinking its environmental footprint is in its own best interests.



Petro-Canada:

taking steps to **reduce energy
intensity** by 1% per year



Petro-Canada began launching major energy efficiency projects at its refineries in 1990, the base year established by the Rio Accord. The company's goal: reduce its energy intensity index by at least one unit per year in all downstream operations.

Pursuing this goal in 1997 led Petro-Canada to make significant investments at its Montreal, Quebec and Oakville, Ontario refineries. Late in the year, the company replaced a heat exchanger in the Unifier process at the Montreal facility with a more modern, efficient design. The upgrade has enabled the refinery to recover, and reuse, larger volumes of waste heat. This change alone has cut energy losses by more than 100 TJ per year and reduced annual CO₂ emissions by 4,500 tonnes. The installation of a new cat cracking unit in 1998 will further improve the facility's energy intensity performance by five units. In Oakville, Petro-Canada optimized its fired process heaters and use of steam, leading to a reduction in annual energy losses of 100 TJ, and a 4,500 tonne per year drop in CO₂ emissions.

As a strong supporter of the Voluntary Challenge, Petro-Canada will continue to upgrade its technology, facilities and practices at its refineries. Moreover, the company will seek additional gains through a continued emphasis on training, procedures and the optimization of its equipment for maximum efficiency. Petro-Canada knows that this approach will decrease its downstream costs while improving economies, competitiveness and benefits to shareholders.

A nighttime photograph of a large industrial facility, likely a refinery or chemical plant. The scene is dominated by the warm, golden glow of numerous overhead lights reflecting off the metallic surfaces of pipes, storage tanks, and structural beams. In the foreground, a person wearing a dark jacket and light-colored pants is seen from behind, walking towards the illuminated complex. The sky above is a deep, dark blue.

Syncrude:

setting lofty **energy
consumption goals**



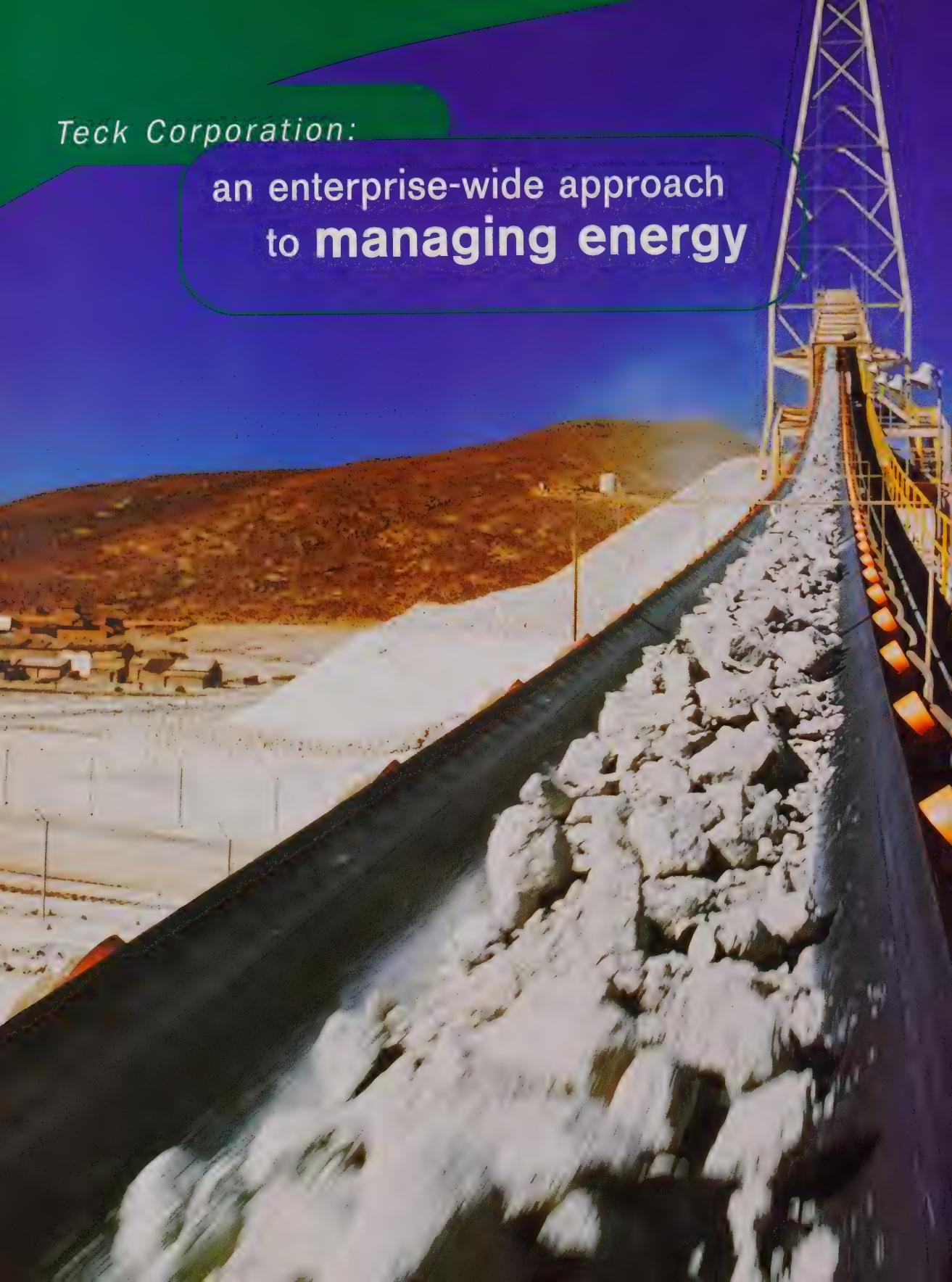
Syncrude Canada Ltd. is not only a major Canadian energy producer, it is one of the country's largest energy consumers. The company operates a massive oil sands plant in north eastern Alberta which annually yields more than 75 million barrels of light, sweet crude oil. Wrenching this oil free from sand is an energy-intensive process which requires Syncrude to use as much as 1% of the total energy consumed in Canada.

As an active participant in the Voluntary Climate Change Challenge, the company is committed to an annual 1% reduction in energy intensity. Reaching this goal has led Syncrude to invest in new technology, more efficient equipment and improved methods.

For example, in 1998, the company spent \$4 million to install a waste heat recovery exchanger on one of its Diluent Recovery Units. The exchanger improves furnace efficiency by using heat from the furnace stack to preheat combustion air. **This not only cuts fuel requirements, it has led to a reduction in CO₂ emissions of 24 Ktonnes per year.** A similar investment in the company's second Diluent Recovery Unit next year will double the total savings.

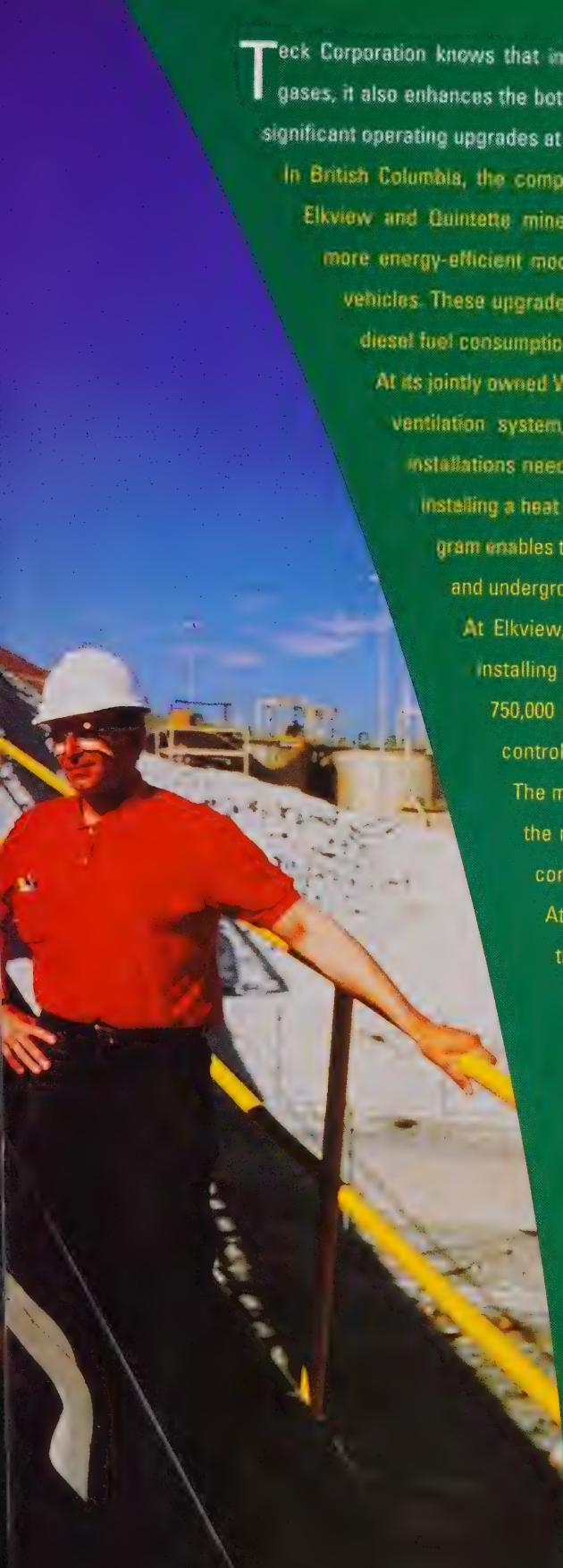
In its mine, the company has increased truck size and taken advantage of engine development over the past two decades to reduce fuel consumption by 32% per cubic meter of earth moved. In its extraction plant, improved methods have led to temperature reductions which are saving energy and reducing emissions by 35,000 tonnes per year. In Syncrude's Upgrader, the company has improved yields and installed equipment to recover hydrogen from the hydrotreater purge gas streams. Combined, these efforts have lowered annual emissions by 900,000 tonnes.

Over the past decade, Syncrude's focus on energy efficiency and emission reduction have enabled it to successfully decrease energy intensity by 12.5% and cut greenhouse gas emissions by 23% per unit of production.



Teck Corporation:

**an enterprise-wide approach
to managing energy**



Teck Corporation knows that improving energy performance not only reduces greenhouse gases, it also enhances the bottom line. That's why the mining leader continues to introduce significant operating upgrades at its 11 Canadian mines.

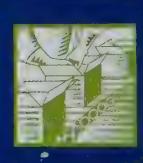
In British Columbia, the company launched improvements to the fleets at its Bullmoose, Elkview and Quintette mines, including the replacement of older trucks with newer, more energy-efficient models, and the installation of energy saving devices on other vehicles. These upgrades led to an annual reduction of tens of thousands of litres in diesel fuel consumption and significant cost savings.

At its jointly owned Williams mine in Marathon, Ontario, the company modified the ventilation system, improving efficiency while reducing the number of fan installations needed. The company also saved 2.5 million litres of propane by installing a heat recovery system. The addition of a new automated control program enables the mine to preset and control peak loads for its production hoist and underground pumps, thereby reducing power consumption.

At Elkview, Teck reduced electricity requirements by 2 GWh/year by installing a pre-cooler on its air compressor, and added savings of 750,000 kWh/year per building by switching to programmable logic controllers to shut down lighting and heating during off hours. The mine has also introduced a program to reduce power used by the main induction fan and launched studies to identify ways to conserve heat from its stack.

At the Niobec mine in Saint Honoré de Chicoutimi, Quebec, the company installed new drive motors and flow propane controllers to improve efficiency. The mine upgraded its underground ventilation system to enable automatic optimization of air flow. It also automated and enhanced its power management system to reduce peak loads and enable the mine to correct the power factor by 95%. Along with new measures to capture waste heat from the air compressor cooler and the installation of electronic controls on air compressors, the energy-efficiency programs at Niobec are making a substantial contribution to the company's efforts to reduce its energy costs.

By approaching energy efficiency as a strategic, enterprise-wide priority, Teck is reaping the benefits where it counts most... on the bottom line.



Sector **reports**

ALUMINUM



PERFORMANCE HIGHLIGHTS

- ➊ ENERGY EFFICIENCY SIGNIFICANTLY BETTER THAN 1990 LEVELS
- ➋ ALCAN BUILDING STATE-OF-THE-ART ENERGY-EFFICIENT SMELTER IN QUEBEC
- ➌ INDUSTRY ACTIVELY MONITORING AND PURSUING TECHNOLOGICAL ADVANCES
- ➍ SECTOR-WIDE ENERGY SEMINAR PLANNED FOR THE NEXT YEAR

CHALLENGES

According to the Canadian Industry Energy End-Use Database and Analysis Centre (CIEEDAC) report on energy consumption and energy intensity indicators, each tonne of aluminum produced in Canada in 1997 consumed an average of 67.75 GJ. The aluminum industry estimates that each tonne produced consumed 66.65 GJ. This shows a slight increase in energy use which is directly related to the increase in the sector's total 1997 production.

The sector's principal challenge continues to be discovering ways to improve its energy efficiency. While some gains will be made through enhanced processes, the most significant improvements will come from the construction of new, state-of-the-art smelters and the phasing out of older facilities. Seventy percent of the total aluminum production currently comes from modern facilities, and developing effective economic models for the continued introduction and funding of new facilities remains a significant industry challenge.

The expansion of aluminum recycling is also a sectoral priority. Aluminum is fully recyclable, and reforming scrap into useful metal requires only 5 percent of the energy consumed in the production of primary aluminum.

ACTION REPORT

Individually and collectively, members of the aluminum sector continue to actively pursue energy efficiency improvements. Ongoing process improvements are chipping away at energy consumption, while capital improvements are dramatically improving the industry's performance.

For example, Alcan is currently constructing a 370 000 tonne capacity smelter in Alma, Quebec. Designed to replace an older, less efficient facility and to add new capacity, the new smelter will employ state-of-the-art technology to reduce the energy required to produce each tonne of aluminum from 57.60 GJ to nearly 46.80 GJ, a decrease of 23 percent.

Cooperative efforts to reduce energy intensity are also under way. The sector has created committees and working groups and commissioned special studies all focused on improving energy efficiency in primary aluminum smelters. The aluminum industry continues to actively monitor and pursue technological advances, such as the introduction of graphitized cathode blocks and, eventually, the development of inert anodes that generate energy efficiency gain. In addition, energy committees have been established within each member company, and sector members are sharing information on energy efficiency in non-competitive areas. A sector-wide seminar on energy use is planned within the next year.

ACHIEVEMENTS

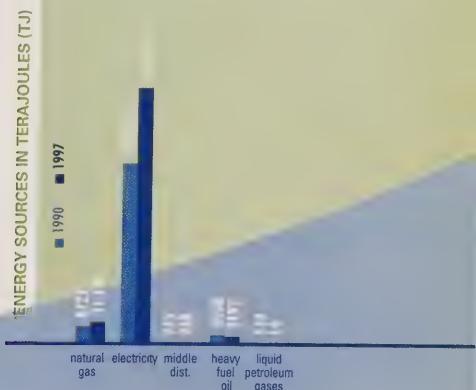
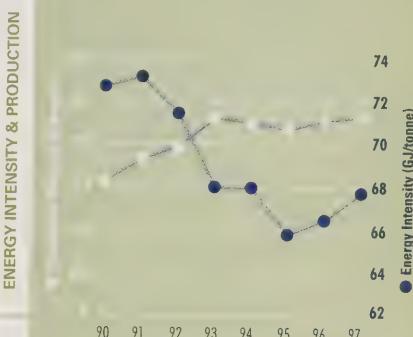
- 1 Since 1990, the aluminum sector has reduced its emissions of tetrafluoroethane (CF_4) and hexafluoroethane (C_2F_6) by nearly 30 percent, with a target of 50 percent by the year 2000.
- 2 From 1990 to 1997, the sector increased aluminum production by almost 46 percent while reducing energy consumption per unit of production. Most potential gains due to process improvement have been realized, and major energy efficiency improvements in the future will result from the construction and expansion of new facilities.

OBJECTIVES & TARGETS

Reductions in the electrical power component needed to produce aluminum can have a substantial impact on production costs. This fact has helped spur cooperative efforts by sector members to achieve industry-wide improvements in energy efficiency. In 1998, the aluminum sector set as its goal a 0.1 percent per year improvement in energy efficiency.

In addition, the aluminum industry has targeted the eventual elimination of anode effects, which generate CF_4 and C_2F_6 , helping to reduce its greenhouse gas emissions and CO_2 equivalent. The sector believes it is in an excellent position to meet Canada's commitment to reduce greenhouse gas emissions to a total of 6 percent below 1990 levels by 2012.

Due mainly to the erroneous classification of some Alcan facilities, the data on energy consumption published last year and this year are incorrect. CIEEDAC, Statistics Canada and Alcan are currently working toward a solution.



BREWERY



PERFORMANCE HIGHLIGHTS

- ➲ INDUSTRY'S 3 PERCENT ANNUAL ENERGY REDUCTION IS THREE TIMES HIGHER THAN ALL SECTORS COMBINED
- ➲ THREE PERCENT ANNUAL REDUCTION RATE MET FOR EACH OF LAST THREE YEARS
- ➲ INDUSTRY-WIDE CAPITAL INVESTMENT PROGRAMS FOCUSED ON ENERGY EFFICIENCY
- ➲ A STEAM RECOVERY INVESTMENT THAT REDUCES GREENHOUSE GAS EMISSIONS PAID BACK IN 10 MONTHS
- ➲ COMPREHENSIVE ENERGY GUIDE FOR BREWERS IS PUBLISHED

Brewing in Canada is a diverse and modern industry actively pursuing its energy efficiency targets. Made up of two national brewing companies, a handful of major regional brewers and numerous local micro-breweries, the sector's 73 breweries employ 16 790 workers at a total annual payroll of \$875 million. To produce its 1997 output of 24.6 million hectolitres, the industry consumed 5 857 TJ of energy, about 74.5 percent of which was natural gas, 4.5 percent fuel oil and 21.0 percent electricity.

CHALLENGES

A flat or declining market for beer has made improving cost control imperative for Canada's brewers. With energy being a substantial cost component in the brewing process, finding ways to improve energy efficiency is a priority for brewers seeking to maintain profitability.

However, efficiency efforts are complicated by the entry of new competitors into the marketplace and by the emergence of "U-brew" establishments in Ontario and British Columbia. Increasing competition in a stagnant market has made it difficult for breweries to realize the energy efficiencies available through greater capacity utilization. Brewers must look to process improvements, equipment upgrades and capital investments as the most promising avenues for improved energy utilization.

ACTION REPORT

In 1997, Canada's brewers continued to invest in improvements to major systems such as process heating, refrigeration and pumping systems. Recent capital projects include:

- switching to the ammonia liquefaction of CO₂ to replace Freon
- installing energy-efficient pasteurizers
- adding capacitance in a bottleshop capacitor bank
- improving steam recovery from bottle-washer condensate and condensate flash tanks
- preheating boiler water
- upgrading condensate systems to return more condensate to the boiler
- installing a new chemical treatment system for a plant cooling tower to reduce water usage
- adding an improved yeast collection system to reduce wastewater treatment loading
- revamping oil heating systems to reduce storage and circulation energy requirements
- re-engineering cooling water systems to reduce electrical pumping costs
- replacing old electric motors and pasteurizers with energy-efficient units
- installing a new oxygen analyser on boilers

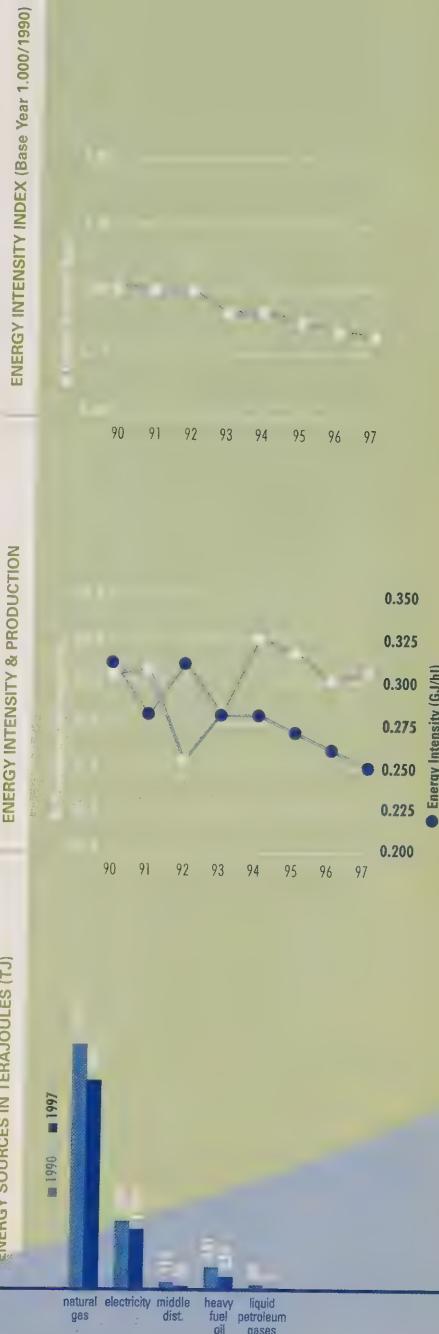
More rigorous maintenance has also been an industry focus. Enhanced metering, monitoring and control have enabled many breweries to improve the energy usage performance of boilers and CO₂, air distribution, pasteurizer, condensate and steam-handling systems. Many breweries are saving energy by establishing more vigorous programs to turn off power to lights and equipment when not in use. Procedural changes have been supported by the establishment of in-plant energy committees and employee education and training programs, in many cases employing NRCan's energy awareness kits and active communication efforts. Within the industry, companies are expanding energy awareness education and encouraging employees to participate in energy management workshops.

ACHIEVEMENTS

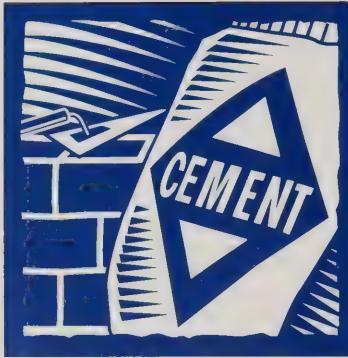
- ① Although production has remained stable since 1990, Canada's brewing industry continues to reduce the amount of both fuel and electricity needed to produce its products. Since 1995, the industry has reduced its energy consumption by 3 percent per year while improving its economic efficiency. The brewing industry's 3 percent annual energy reduction target is three times higher than CIPEC's goal for all sectors combined, and the sector has met its target in each of the past three years.
- ② Breweries have also implemented programs to reduce water usage. One brewery, for example, invested \$8000 to recover flash steam from its brewing kettle. The investment not only enabled the recovery of previously vented water, it also contributed significantly to a reduction in greenhouse gases and paid back the company's investment within 10 months.
- ③ In November 1998, the Brewers Association of Canada Environment Committee, with the support of NRCan, released an energy efficiency guide for brewers. The guide highlights a vast array of energy-saving opportunities within the brewery environment and identifies ways that energy efficiency activities can also save costs. The guide is an excellent reference for individual energy efficiency action plans and will further efforts to sustain the sector's energy reduction performance.

OBJECTIVES & TARGETS

Canada's brewers are committed to a 3 percent per year reduction in energy usage per unit of production through the year 2000, three times higher than the annual CIPEC target. Reductions are derived from the 1995 base year energy usage of 272.7 MJ/hl. The target for 1998 is 250 MJ/hl of production.



CEMENT



PERFORMANCE HIGHLIGHTS

- ➲ CLINKER CAPACITY UTILIZATION RATES INCREASED BY AN IMPRESSIVE 5.4 PERCENT IN 1997
- ➲ BLUE CIRCLE CEMENT, ESSROC, ST. LAWRENCE CEMENT AND LAFARGE CANADA ALL REPORTED ENERGY EFFICIENCY INVESTMENTS DURING THE YEAR
- ➲ CEMENT MANUFACTURERS HAVE ACHIEVED A 30 PERCENT ENERGY REDUCTION PER TONNE SINCE THE MID-1970S
- ➲ MANUFACTURERS CONTINUE TO IMPROVE ENVIRONMENTAL PERFORMANCE BY AUGMENTING THE USE OF WASTE MATERIALS AND FUELS IN THE PRODUCTION PROCESS
- ➲ THE CANADIAN PORTLAND CEMENT ASSOCIATION ACTIVELY COLLECTS INFORMATION RELATED TO ENERGY SAVING, EMISSIONS AND THE ENERGY-EFFICIENT APPLICATION OF CEMENT AND CONCRETE PRODUCTS

The cement sector provides the raw materials on which Canada's construction and infrastructure industries are built. The cement industry is also a significant exporter, earning the country substantial export revenues. The industry's nine companies operate 17 manufacturing facilities with a combined production capacity of 14.2 Mt of clinker¹ in 1997, using about 57 306 TJ of total energy. More than 2900 people producing the product are sharing an estimated total annual payroll of \$151 million. Year-over-year clinker capacity utilization rates increased by an impressive 5.4 percent in 1997, as cement shipments rose 5.7 percent.

The principal energy sources used for cement production are coal, natural gas and petroleum coke. Since 1990, the cement sector has reduced its total energy use by more than 7 percent.

CHALLENGES

While cement manufacturers are looking to the use of waste materials (such as discarded tires) as an economical source of fuel, discussions among waste producers and waste users have yet to produce an appropriate methodology to establish credits for waste material use. Similarly, the complex process of negotiating international agreements has delayed the establishment of standardized accounting methods for embodied energy in cement exports.

The industry continues to promote concrete as an energy-efficient product and to make cement and concrete the materials of choice in the environmental industry. It is also working to develop an appropriate methodology for the life cycle assessment of cement-based materials and products.

ACTION REPORT

Cement manufacturers continued to invest in energy efficiency in 1997. For example, Blue Circle Cement replaced the clinker cooler at its Bowmanville, Ontario, plant to increase the recovery and reuse of heat and to reduce power consumption. The company also installed power monitoring equipment. At its St. Mary's, Ontario, plant, Blue Circle modified cement finish grinding mills to improve grinding efficiency.

Essroc Canada installed chains in its Picton, Ontario, rotary kiln to lower fuel consumption by enhancing heat transfer. St. Lawrence Cement is using treated wood in addition to coal and coke at its Joliette, Quebec, facility, thereby lowering greenhouse gas emissions.

Lafarge Canada has cut energy consumption by installing an electric-drive pipe belt conveyor system for raw materials to replace a compressed air-powered unit at its Bath, Ontario, plant. The company also installed equipment to enable energy-saving indirect fuel firing. At its Richmond, British Columbia, plant, Lafarge is retiring old wet kilns and replacing them with an energy-efficient dry kiln. The new kiln will be in operation in early 1999 and will cut energy consumption per tonne of clinker in half.

¹ Clinker is the manufacturing intermediate prior to cement production.

ACHIEVEMENTS

- ① Cement, in the form of concrete, has a number of energy-saving advantages. For example, highways paved in concrete can save heavy trucks up to 20 percent in fuel consumption. Houses built with insulating concrete forms reduce energy use by up to 40 percent.
- ② Within the industry, cement manufacturers have achieved a 30 percent energy reduction per tonne since the mid-1970s by converting from a wet to a dry manufacturing process and improving heat recovery systems. Emissions have been reduced by incorporating fly ash, silica fume and blast furnace slag as a supplement in concrete. Manufacturers continue to improve environmental performance by augmenting the use of waste materials and fuels in the production process.
- ③ The industry holds regular environmental committee meetings and actively supports research and development efforts aimed at improving energy intensity and reducing emissions. The Canadian Portland Cement Association is also actively involved in collecting information related to energy saving, emissions and the energy-efficient application of its products.

OBJECTIVES & TARGETS

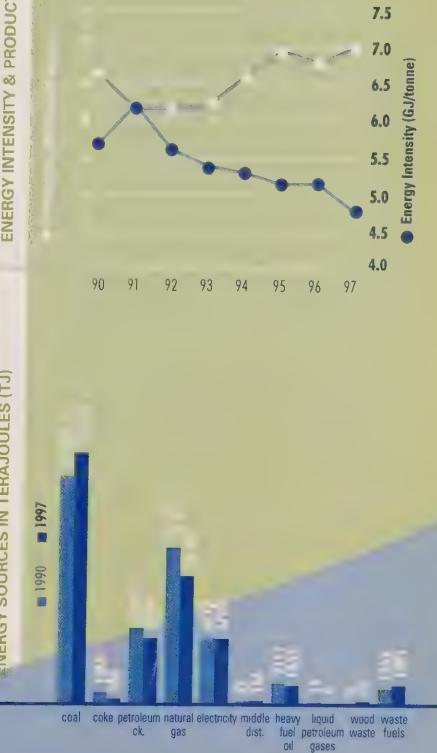
The cement sector's energy intensity target is an improvement of 0.7 percent per year through the year 2000. Success in reaching this goal depends on continued strong demand for the industry's products, along with the acceptance of standard measurement methodologies covering waste fuel efficiencies and energy embodied in export products.

The Canadian Portland Cement Association estimates that by the year 2000, total emissions associated with domestic cement consumption will be 6 percent below 1990 levels. This projection is based on an estimated 12 percent increase in domestic consumption between 1997 and 2000. Associated emissions per tonne of concrete product should show a 14 percent decrease in CO₂ compared to 1990.

ENERGY INTENSITY INDEX (Base Year 1.000/1990)

ENERGY INTENSITY & PRODUCTION

ENERGY SOURCES IN TERAJOULES (TJ)



C H E M I C A L



PERFORMANCE HIGHLIGHTS

- ➲ NEARLY ALL INDUSTRY SUBSECTORS ARE MEETING ENERGY INTENSITY PERFORMANCE TARGETS
- ➲ COGENERATION FACILITIES ARE LEADING TO THE MORE EFFICIENT USE OF HYDROCARBON FUELS
- ➲ ALL CANADIAN CHEMICAL PRODUCERS' ASSOCIATION (CCPA) MEMBER COMPANIES SUBSCRIBE TO THE ASSOCIATION'S RESPONSIBLE CARE® INITIATIVE
- ➲ THE CHEMICAL SECTOR IS A STRONG SUPPORTER OF THE VCR INC
- ➲ THE SECTOR CONTINUES TO IMPROVE ENERGY EFFICIENCY AND REDUCE GREENHOUSE GAS EMISSIONS PER UNIT OF OUTPUT

The chemical sector is a diverse industry producing organic and inorganic chemicals as well as plastics and synthetic resins. Combined, companies in this sector operate 600 facilities Canada-wide, employing 23 000 people at an annual payroll of \$1.3 billion. In 1997, the sector's energy consumption, at 199 935 TJ, was a modest increase over 1990 levels. However, the constant dollar value of its products increased substantially, about 15 percent over 1990 and 8 percent in 1997 alone.

Since 1992, the constant dollar value of the sector's output has increased by 24 percent while growth in its greenhouse gas emissions in equivalent CO₂ tonnes has been limited to 3 percent. While direct CO₂ emissions have increased 5 percent, emissions per unit of output have decreased by 15 percent. In total, the global warming potential per unit of output has decreased by 17 percent.

Nearly all industry subsectors are meeting their energy intensity performance targets, matching, and in some cases substantially improving on, benchmark 1990 levels. Contributing to the sector's performance is the installation of cogeneration facilities, which results in the more efficient use of hydrocarbon fuels to generate heat and electricity.

CHALLENGES

While all industry subsectors report significant energy efficiency gains, there are substantial variations in energy consumption patterns. Moreover, as the industry moves to take advantage of cogeneration opportunities, steam is becoming an increasingly significant energy source. The use of natural gas and petroleum distillates as a feedstock, coupled with rapid changes in the mix of fuels used, has made it difficult for the industry to accurately report energy usage patterns.

ACTION REPORT

As a condition of membership in the Canadian Chemical Producers' Association (CCPA), companies must subscribe to the association's Responsible Care® initiative. Responsible Care® establishes guiding principles and codes of practice covering all aspects of the chemical life cycle, including the requirement that each member report annually on the emission of as many as 500 substances. A strong supporter of the VCR Inc., CCPA requires members who are large emitters of CO₂ to register and encourages members with lower emissions to do so as well.

Individual manufacturers have also taken noteworthy actions in 1997 to improve their energy efficiency. For example, Dow Chemical, NOVA Chemicals and Bayer have joined forces in a Sarnia, Ontario, cogeneration project. Facilities at Dow and Bayer produce electricity and steam from natural gas, reducing emissions and using energy more cost-effectively. Moreover, individual site projects have helped Dow to recover energy generated in one process for use in another and enabled the company to use cogeneration to produce most of its energy.

NOVA Chemicals also successfully completed a pilot project to recover waste CO₂ and prepare it for commercial sale. In another pilot project, the company tested the use of lower temperatures in the ethylene furnaces at its Joffre, Alberta, plant. The test demonstrated that reduced operating temperatures could improve furnace performance by boosting heat transfer efficiencies, thereby increasing productivity while saving fuel. A new NOVA Chemical ethylene plant at Joffre, planned for commissioning in the year 2000, will operate with a 30 percent improvement in energy efficiency.

Shell Chemicals Canada Ltd. (SCCL) has designed its new Scotford, Saskatchewan, ethylene glycol plant to minimize greenhouse gas emissions. The company is integrating heating systems with its adjacent styrene plant, installing a cogeneration plant and recovering for sale normally vented CO₂. When the plant begins operations in the year 2000, the company will benefit not only from reduced CO₂ and methane emissions, but from lower capital and operating costs as well. By applying similar thinking to its other operations, the company has reduced its greenhouse gas emissions at all of its facilities.

DuPont Canada has trimmed the impellers in the large pumps at its Maitland, Ontario, site, enabling the plant to reduce energy consumption as well as repair costs.

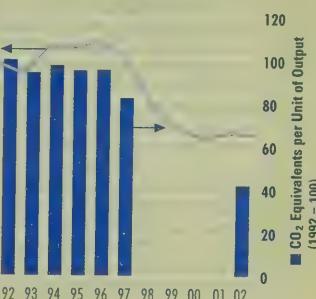
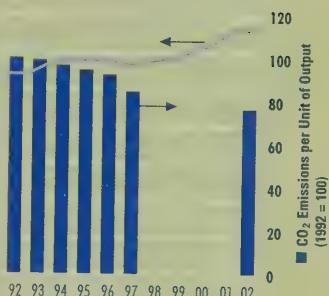
ACHIEVEMENTS

Thanks in part to strong encouragement from the CCPA, the chemical sector remains in the forefront of support with its National Emission Reduction Masterplan and its support for the VCR Inc. The sector continues to register significant energy efficiency gains as well as reductions in greenhouse gas emissions per unit of output. Both the CCPA and its individual members are active in communicating the sector's progress to a variety of interested parties.

OBJECTIVES & TARGETS

The chemical sector will continue to employ a combination of capital investment and innovative process improvements to achieve ongoing reductions in emissions per unit of output. In addition, the sector and its trade association remain focused on enhancing energy use management, including the public reporting of the sector's energy efficiency performance. Thanks to the active stewardship of its members, the CCPA estimates that by the year 2002, CO₂ per unit of output will decrease by as much as 24 percent compared to 1992.

The chemical sector believes that ongoing success in improving energy efficiency and reducing greenhouse gas emissions requires a long-term perspective by both the industry and government.



Footnotes:

- Emission forecasts from member companies are assumed to take into account announced capacity increases.
- Historical chemical output was calculated using constant 1992 \$, taking into account annual average chemical pricing changes as a way of converting sales dollars into tonnage.
- Chemical output is forecast to grow 5% per annum from 1997 to 2002 based only on announced projects.
- About 10% of the output is from non-CCPA member companies; emissions are from member companies only.



PERFORMANCE HIGHLIGHTS

- ⚡ EVALUATING NEW ENERGY-SAVING TECHNOLOGIES
- ⚡ STUDYING ENERGY USE IN FLUID MILK PRODUCTION
- ⚡ TOTAL ENERGY CONSUMED IS DOWN WHILE PRODUCTION IS UP
- ⚡ COMPETITIVE, LOW-MARGIN MARKET STRAINS ABILITY TO INVEST IN ENERGY EFFICIENCY

A truly national industry, Canada's dairy product manufacturing sector employs 22 000 people in more than 270 facilities from coast to coast. In 1997, Canada's dairies processed 74 million hectolitres of raw milk and shipped products with an estimated value of \$8 billion.

Energy is a key component in milk processing. Dairy product manufacturers use energy for such processes as pasteurization, churning, washing, packaging, cooling, freezing and drying. Manufacturers typically employ electrical, thermal and water-based energy systems in their facilities.

CHALLENGES

The road to greater energy efficiency is paved with challenges for dairy product manufacturers. To begin with, dairy processors are caught between a regulated milk producer sector and retail, restaurant and institutional markets that demand high quality, value-added products at the lowest possible price. In addition, industry rationalization and competitive pressures are compelling large companies to reduce excess capacity while retaining and expanding market share. These forces have combined to make productivity and cost reduction key industry issues.

Moreover, the trend toward extended shelf life (ESL) products has increased the energy needed in many procedures. Producing ESL products requires ultra-high-temperature pasteurization and the use of special fillers. These process alterations require significantly more energy per unit of output.

ACTION REPORT

The National Dairy Council of Canada continues to encourage industry-wide participation in energy conservation efforts. Each product subsector is encouraged to implement its own comprehensive set of low-cost, no-cost and retrofit improvements in dozens of plant operations. These include thermal storage of recovered hot water, exterior tanker recycled water washes and improved control of air and water leakage. Information on expected cost savings and payback periods are provided to companies seeking to make such improvements. The National Dairy Council of Canada, in partnership with NRCan, supports the energy efficiency achievements of dairy plant managers through research and educational materials.

The industry is also profiling and evaluating new energy-saving technologies. Such concepts include expert control systems, non-thermal pasteurization systems, pulsed drying systems and just-in-time dairy manufacturing concepts. Training is available to help energy managers measure energy efficiency and to direct them to global studies on successful dairy product energy management strategies and practices.

National Dairy Council staff and member companies are assisting Marbeck Resource Consultants in an extensive examination of the energy use reported by fluid milk processors. Through the analysis of existing data, the study will provide dairies with valuable energy performance indicator information. Results of the study will be made available to dairies in 1999.

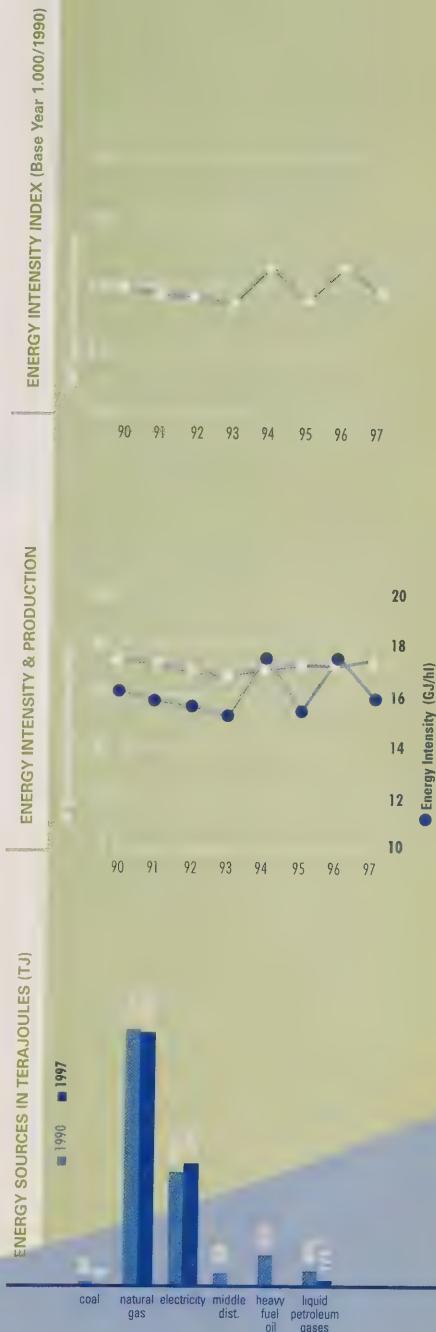
The energy efficiency efforts of Amalgamated Dairies Limited were recognized by the inclusion of the company in a collection of CIPEC "success stories." The document was released at the Joint Ministers' Meeting held in Halifax in November 1998.

ACHIEVEMENTS

- ① As international trade is liberalized and world markets become more integrated, Canadian dairy product manufacturers and marketers will face increased competition in both domestic and world markets. To prosper in a rapidly changing marketplace, the dairy industry has continued to focus on the image of milk products as wholesome, low-cost food sources. These efforts are aided by the industry's success in lowering costs through improved energy efficiency.
- ② In 1997, the dairy product manufacturing sector's total energy consumption was 11 854 TJ, down slightly from the 1990 level of 11 952 TJ. Conversely, the amount of milk and cream produced in 1997 was up from 1990 levels. Except for the years 1994 and 1996, energy intensity has remained relatively constant, with energy consumed in gigajoules per hectolitre of milk processed now averaging 2 percent below the 1990 level.

OBJECTIVES & TARGETS

Canada's dairy industry is committed to a 1 percent per year energy efficiency improvement through the year 2000. Manufacturers have made most of the low-cost and no-cost energy efficiency improvements available to them. Their challenge now is to make the more costly, payback-delayed improvements needed despite the economic pressures of a highly competitive market.



ELECTRIC and ELECTRONIC



PERFORMANCE HIGHLIGHTS

- ⚡ ENERGY REMAINS A SMALL COMPONENT IN THE SECTOR'S COST STRUCTURE
- ⚡ NORTEL SETS GLOBAL ECO-EFFICIENCY TARGETS
- ⚡ HONEYWELL REDUCES SPACE-RELATED ENERGY COSTS
- ⚡ ELECTRO-FEDERATION OF CANADA IS AN ACTIVE MEMBER OF THE BUILDINGS TABLE ON CLIMATE CHANGE
- ⚡ SECTOR ENERGY CONSUMPTION DROPS 11 PERCENT DESPITE INDUSTRY GROWTH

The companies that make up the electric and electronic sector operate 1 412 facilities employing 119 353 workers across Canada. The sector is diverse in scope and includes companies that produce electrical appliances of all sizes, lighting, consumer electronics, communication and electronic equipment, cabling, office equipment, industrial equipment and other electrical products.

The industry is a major exporter and a vital, growing contributor to the national economy. In 1997, total shipments reached \$28.8 billion, 7 percent of the total for all Canadian manufacturing. Between 1990 and 1997, gross output for the sector increased by about 76 percent and GDP increased by approximately 71 percent.

In 1997, the industry consumed approximately 16 260 TJ of energy. This represents about 0.6 percent of the energy consumed by the manufacturing sector as a whole and results in about 0.3 percent of total energy-related manufacturing CO₂ emissions. On average, expenditures on energy are equivalent to less than 1 percent of the value of the industry's shipments, compared to more than 60 percent for materials and supplies, and 16 percent for labour. Natural gas and electricity satisfy virtually all of the industry's energy requirements.

CHALLENGES

Greenhouse gas emissions and energy efficiency initiatives are not considered by many manufacturers as among the top challenges facing the industry. Most companies view technological change, market growth, sales and distribution issues as far more critical to the industry's health. Moreover, both domestic plants and subsidiaries of foreign corporations are fearful that possible Canadian actions to reduce greenhouse gas emissions in response to the Kyoto commitment may place their plants at a competitive disadvantage compared to foreign-based plants without similar environmental constraints. And most companies, with a primary focus on the next two fiscal quarters, feel that the long-term commitment to targets as far as a decade away is unrealistic.

ACTION REPORT

While the industry as a whole has yet to adopt increased energy efficiency as a mission-critical target, companies within the sector have launched their own energy programs. For example:

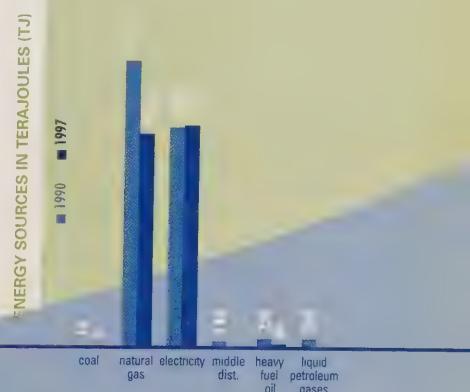
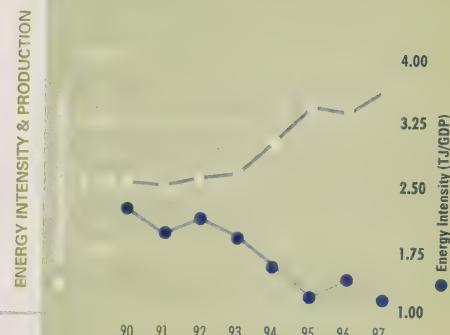
- Nortel has established eco-efficiency targets for its global operations. In 1997, the company achieved a 17 percent reduction in greenhouse gas emissions based on a 1993 baseline.
- Belleville Manufacturing completed a lighting system retrofit that has led to annual energy cost savings of \$77 000.
- Honeywell has closed a number of sites and consolidated operations into existing facilities. This enables the company to handle the same workload from greatly reduced floor space. Honeywell also encourages many employees to "telecommute" from home offices. Combined, these actions have slashed Honeywell's energy bill as well as its employees' use of gasoline.
- The Electro-Federation of Canada (EFC), a key industry association, is actively involved in the Buildings Table on climate change. The Buildings Table focuses on the energy efficiency of commercial, industrial and residential buildings, and its recommendations will affect all EFC members in one way or another. The EFC is now soliciting comments from the industry on a foundation paper prepared for the Buildings Table.

ACHIEVEMENTS

While the electric and electronics industry is Canada's least energy-intensive manufacturing sector, individual companies continue to include energy efficiency as a vital component in their efforts to control costs. Between 1990 and 1997, the sector's energy consumption dropped 11 percent despite a substantial growth in production. Combined, these trends have resulted in a decrease in energy intensity of almost 50 percent.

OBJECTIVES & TARGETS

The electric and electronic sector has set as its target a 1.25 percent per year improvement in energy efficiency. As manufacturing operations and distribution channels continue to consolidate, the industry expects to achieve a decrease of one-third in energy consumption over the next decade.



FERTILIZER



PERFORMANCE HIGHLIGHTS

- ➲ MOTIVATED BY ITS ENERGY-INTENSIVE PROCESSES, THE FERTILIZER INDUSTRY HAS BECOME HIGHLY ENERGY-EFFICIENT
- ➲ POTASH PRODUCERS USED 10 PERCENT LESS ENERGY IN 1997 THAN IN 1990, DESPITE A 42 PERCENT RISE IN PRODUCTION
- ➲ A TASK FORCE FOUNDATION PAPER IS UNDER DEVELOPMENT TO FURTHER IMPROVE THE INDUSTRY'S ENERGY EFFICIENCY

Canada's fertilizer sector, which includes the agricultural fertilizer and potash subsectors, is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers. The industry operates more than 30 production facilities manufacturing 12 percent of the world's total fertilizer output. The industry's domestic agriculture sales total more than \$2 billion annually, supporting a network of over 1500 distributors and retailers across the country. Seventy-five percent of production is exported, earning in excess of \$3 billion per year in foreign exchange revenues. The manufacture, distribution and sales of fertilizer products employ more than 12 000 employees from coast to coast.

While 90 percent of Canadian-made fertilizers are used in crop production, fertilizer products have an impact far beyond the agricultural sector. For example, industry commodities such as ammonia are common components in household cleaning products and detergents. Potash-based products include water softening agents and a substitute for table salt, while urea is a common de-icing agent and livestock feed protein supplement. Manufacturers use fertilizer-industry-produced products to create synthetic fibres, plastics, glues and metals, and both industry and government rely on the sector for materials vital to the treatment of wastewater and contaminated soil.

In 1997, Canada's agricultural fertilizer and potash producers consumed 93 321 TJ of energy, consisting primarily of natural gas, electricity and middle distillates. A substantial portion of the natural gas employed is used as a feedstock to generate hydrogen, an essential ingredient in the production of ammonia. While the use of natural gas almost doubled in 1997, the overall energy mix remains similar to that of the 1990 base year.

CHALLENGES

Animals, humans and human technological activities consume oxygen and release CO₂. Plants absorb CO₂ and release oxygen. When in harmony, these forces create a stable, but delicate, balance of gases in the atmosphere. Mineral fertilizers help support the natural balance by increasing the plant biomass that absorbs CO₂ and produces the oxygen vital to animal life and human activity.

The rapidly growing world population is challenging mankind's ability to meet its minimum food requirements. Productive crop land is limited, and large tracts are being lost to urban growth. For the agricultural industry to boost and sustain its production to meet the demands of population growth, high-yield practices must be embraced. The fertilizer industry will make a vital contribution to the sustainability of global food production by focusing on the responsible production and use of fertilizer to nourish the world's soil.

ACTION REPORT

While the sector continues to develop and employ energy-efficient new technologies, sector companies regard information on many of their specific activities as confidential.

ACHIEVEMENTS

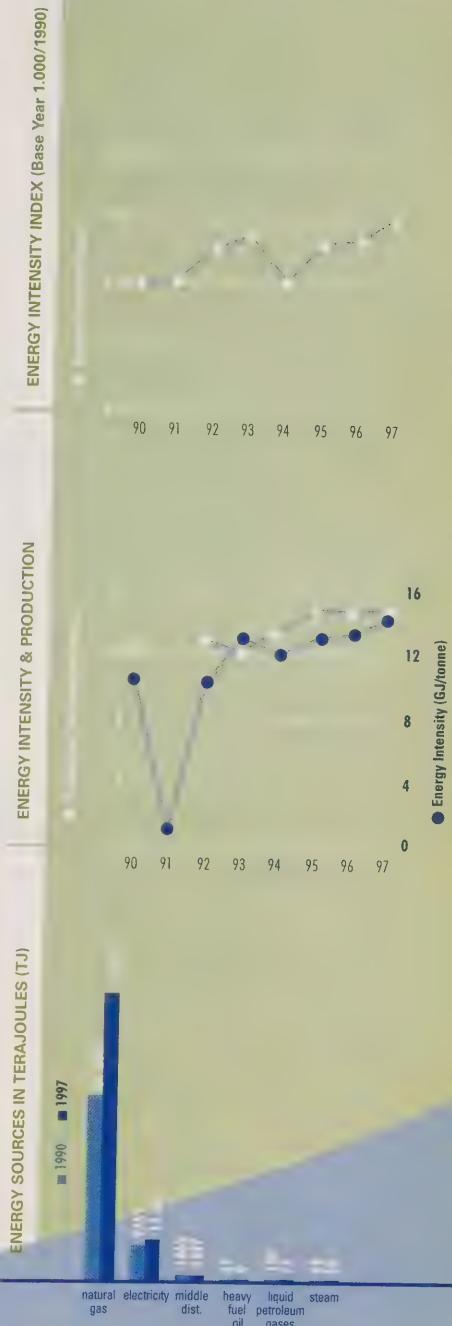
Canadian fertilizer manufacturers are constantly improving production methods, reducing emissions and increasing energy efficiency. Their efforts have made Canada an acknowledged world leader in energy efficiency and the control of emissions from its fertilizer production facilities.

Producing nitrogen and potash fertilizers is energy-intensive, making energy conservation and efficiency a key industry priority. In fact, Canada's success in reducing energy intensity is a major factor in the industry's ability to remain internationally competitive.

- ① Since 1990, for example, potash production has increased 42 percent to a total of 9 001 154 t in 1997. Since 1990, energy consumption by potash producers has risen with increases in production, but the energy component per tonne has declined. In 1997, potash production required 3.59 GJ/t of output compared to 3.92 GJ/t in 1990.
- ② According to the CIEEDAC database, agricultural fertilizer production increased from 5 436 473 t in 1990 to 5 758 976 in 1997. The Canadian Fertilizer Institute (CFI) database shows production totals of 7 701 136 t for 1990 and 9 908 887 t for 1997. CIEEDAC reports energy consumption of 35 908 TJ in 1990 and 60 936 TJ in 1997. CFI finds no production data that supports a 70 percent increase in gas consumption, and it believes that there is a strong possibility that some of the natural gas used as a feedstock in the production of ammonia was included in the energy consumption data. The Fertilizer Industry Task Force is working to address these data inconsistency issues.
- ③ Energy indicators show an improvement in energy intensity for the sector which averages over 1 percent per year since 1990.

OBJECTIVES & TARGETS

The fertilizer industry has a task force that is developing baseline information on energy use for the sector. This data will help the industry better measure its usage patterns and monitor its success in improving energy efficiency. Moreover, the current focus on climate change is providing additional impetus for fertilizer producers to maximize energy intensity improvements and further limit greenhouse gas emissions.





PERFORMANCE HIGHLIGHTS

- ➲ FOOD PROCESSING COMPANIES CONTINUE TO INVEST IN ENERGY EFFICIENCY AND FUEL SWITCHING
- ➲ THE INDUSTRY SHOWS A NET ENERGY INTENSITY IMPROVEMENT UP TO 1997 OF APPROXIMATELY 6 PERCENT
- ➲ FOOD PROCESSING TASK FORCE CURRENTLY DEVELOPING AN ENERGY EFFICIENCY TARGET AND RELATED WORK PLAN
- ➲ IN 1999, THE SECTOR WILL LAUNCH A COMMUNICATION CAMPAIGN TO REACH SENIOR EXECUTIVES IN MORE THAN 3000 COMPANIES
- ➲ THE SECTOR WILL NAME SENIOR EXECUTIVE ENERGY CHAMPIONS TO LEAD ENERGY AWARENESS EFFORTS

Members of Canada's food processing sector operate approximately 3000 establishments and employ about 200 000 people across the country. The sector includes manufacturers producing a diverse range of products, including meat, poultry, fruit and vegetables, flour and bakery products, oils and sugars, coffee, snack foods and confections.

The need to bake, process, cool and ventilate makes food processing an energy-intensive activity. In fact, the sector's energy consumption in 1997 approached 93 150 TJ, up from 85 608 TJ in 1990. Within the sector, companies continue to invest in energy efficiency. The installation of energy-efficient air pressure blanket doors and air reclaimers as well as the modernization of equipment and facilities have all helped to improve energy efficiency. Food processors have also actively pursued fuel switching, moving from carbon-intensive fuels such as oil to natural gas. Since 1990, electricity use has remained stable, while steam use has increased and heavy fuel oil has declined.

In general, the industry shows a net energy intensity improvement up to 1997 of approximately 6 percent.

CHALLENGES

The food processing industry's diversity and the fact that food processing companies are often part of larger organizations that operate in a variety of businesses make it difficult to find a workable definition for the sector. Developing meaningful energy consumption data will require a review and modification of the narrow boundaries established by the Standard Industrial Classification Code.

In addition, the industry's historical competitive advantage of lower energy costs is steadily eroding. This is challenging the industry to find new ways to reduce what is a significant food product cost component.

ACTION REPORT

The Food Processing Task Force is currently developing an energy efficiency target and related work plan. Suggested components of the plan include:

- holding energy efficiency seminars to build awareness
- establishing high-level energy champions for the sector to better position energy efficiency among food processing companies
- confirming the quality of baseline energy data
- extending the Task Force's reach to encompass a greater breadth of subsectors

Individually, food processors are also taking significant actions on the energy front, as part of good manufacturing practices.

Cuddy Food Products has installed more efficient steam generating and hot water handling systems along with a high-speed automated slaughtering system in its chicken processing operations. These modifications enable the company to produce 40 percent more product with the same hot water consumption. Taking advantage of idle capacity in its ice making processes and the addition of a computerized building management system are also improving energy efficiency.

Industrial Energy Innovators Award winner Maple Leaf Meats has introduced wide-ranging improvements as part of its nine-step energy management action plan. Downsizing an air compressor, mounting controls on its high-pressure wash system and installing capacitors that eliminate power factor penalties are saving a combined \$53 000 per year in power costs. A retort heat recovery system has cut natural gas costs by \$37 000 per year and netted substantial savings in maintenance and operating expenses.

Kraft Canada recently completed a two-phase heat recovery project at its Cobourg, Ontario, plant. Heat recovered from the boiler room exhaust system and from cooking and drying systems is used for a number of applications, including preheating boiler feed water, heating process water and space heating. Kraft invested more than \$2 million in its combined heat recovery projects, with a projected annual energy saving of 100 000 GJ.

ACHIEVEMENTS

- ① In 1999, the sector will launch a communication campaign in an attempt to reach senior executives in more than 3000 companies. The campaign will seek to raise the sector's profile and to promote energy efficiency in the food processing industry, the nation's third-largest employer. The sector also plans to run "Dollars to Sense" workshops, tailor the "Energy Master Plan" workshop to meet the needs of food processors and focus on the Kyoto targets with the "Monitoring and Tracking" workshops.
- ② The food processing sector believes that in terms of Canada's climate change initiatives, it fits within the CIPEC industrial mandate. The industry will continue to operate under the CIPEC umbrella and abide by industrial targets for the sector. Data covering food processing collected under CIPEC will be forwarded to Agriculture Canada to support its National Table efforts.
- ③ The sector plans to name two senior executive energy champions in the near future: one from food processing and one from food retailing. This move will enable all parties to work in unison to promote energy efficiency activities.

OBJECTIVES & TARGETS

The Food Processing Energy Task Force continues to work on the establishment of targets that will be part of the sector's contribution toward Kyoto objectives.

ENERGY INTENSITY INDEX (Base Year 1,000/1990)

90 91 92 93 94 95 96 97

ENERGY INTENSITY & PRODUCTION

90 91 92 93 94 95 96 97

ENERGY SOURCES IN TERAJOULES (TJ)

■ 1990 ■ 1997

coal coke natural gas electricity middle dist. heavy fuel oil liquid petroleum gases steam



PERFORMANCE HIGHLIGHTS

- ⚡ THROUGH INVOLVEMENT IN INDIVIDUAL PROGRAMS, CONTINUALLY STRIVING TO BECOME MORE ENERGY-EFFICIENT WHILE REMAINING COMPETITIVE
- ⚡ WANT TO MEET ALL GOVERNMENT REGULATIONS AND THUS BE KNOWN AS AN ENVIRONMENTALLY FRIENDLY INDUSTRY
- ⚡ CONTRIBUTE TO OVERALL REDUCTION IN GREEN-HOUSE GASES
- ⚡ CONTINUE CONTACT WITH FOUNDRIES TO INCREASE THEIR PARTICIPATION IN CIPEC

Canada's foundry industry produces the metal castings that make up the first step in the manufacture of most durable goods. Ninety percent of all manufactured goods depend either directly or indirectly upon castings.

In 1997, the total amount of metal poured was 896.8 t and included iron, steel, aluminum, copper base and other nonferrous metals. Much of this material was made up of energy-conserving recycled metals. There are approximately 250 foundries in Canada, employing 15 000 people and generating annual sales of \$1.5 billion. About two-thirds of the foundry sector's production is exported.

CHALLENGES

Energy in the form of heat is a major component in the casting process. Under continual pressure to be cost and price competitive while meeting environmental standards, Canada's foundries are engaged in an endless search for more energy-efficient equipment and methods. Recognizing that their best interests lie in meeting all applicable environmental standards as well as reducing the energy component in their products, most foundries are closely monitoring energy consumption and implementing programs to improve energy efficiency.

ACTION REPORT

Foundry sector members continued their efforts to upgrade operations through the introduction of energy-efficient technology. For example:

- Ancast cut natural gas costs by introducing cold box core machines to replace four gas-fired machines. The company eliminated gas heating torches by installing enclosed ladles for ductile iron treatment and proprietary refractory ladle lining shells. The new ladle enables molten iron to be tapped at temperatures 10°C cooler than previously possible.
- Ancast also improved the energy efficiency of its buildings by replacing inefficient air conditioning and cooling in various locations and by improving its storage space utilization. To save electricity, the company installed high-efficiency motors and metal halide lighting and replaced compressed air hoists with more efficient electric-powered units.
- Dominion Castings installed a new 30 t electric arc furnace, which improved furnace energy performance by 0.036 GJ/t and reduced its annual energy bill by more than \$27 000. The company installed "powersmart" computers on four compressor units, cutting power requirements by 38.88 GJ per week and saving an additional \$40 000 per year. Dominion Castings also changed its heating strategy, eliminating steam heating systems and replacing electric heating with natural gas. Switching from steam heat alone has cut the company's energy requirements by 31.64 GJ per year at a saving of more than \$11 000 annually.

ACHIEVEMENTS

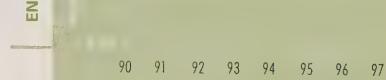
Most of Canada's foundries continue to seek ways to improve their energy efficiency and reduce greenhouse gas emissions. Many firms, for example, no longer use greenhouse-gas-generating fuels such as coal, oil or coke in their operations. Many have also eliminated the use of steam produced by coal-generated electricity. The potential cost savings resulting from energy efficiency improvements made by the foundry industry are estimated to be in the range of \$9 million per year.

For these companies and others, environmental and bottom line concerns continue to be motivating forces behind individual efforts to promote and enhance energy efficiency.

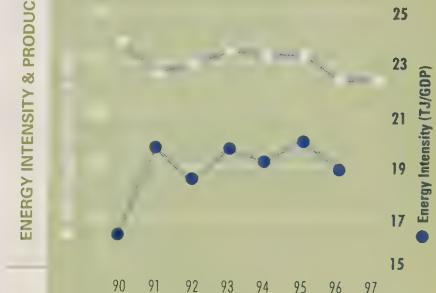
OBJECTIVES & TARGETS

In 1995, the foundry sector established as its target a 1 percent per year reduction in total energy consumption. Driven by environmental and cost concerns, the industry is actively engaged in fuel-switching programs and in the introduction of more energy-efficient equipment and methods. Thanks to the commitment of its members, the foundry sector plans to continue to record year-over-year improvements in its energy efficiency performance.

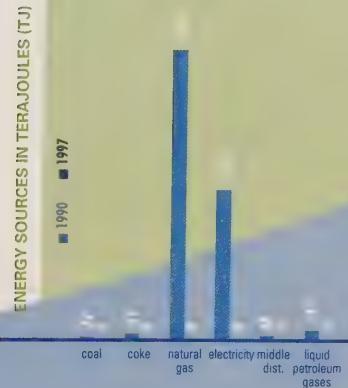
ENERGY INTENSITY INDEX (Base Year 1,000/1990)



ENERGY INTENSITY & PRODUCTION



ENERGY SOURCES IN TERAJOULES (TJ)



GENERAL MANUFACTURING



PERFORMANCE HIGHLIGHTS

- ⚡ NEW ENERGY EFFICIENCY TASK FORCE LAUNCHED IN 1998 WITH 14 LEADING FIRMS PARTICIPATING
- ⚡ NEARLY ALL TASK FORCE MEMBERS EXCEED A 1 PERCENT ANNUAL GAIN IN ENERGY EFFICIENCY
- ⚡ KINDRED INDUSTRIES CUT ITS NATURAL GAS BILL BY 37 PERCENT IN FIVE YEARS DESPITE DOUBLED PRODUCTION
- ⚡ TRANSNATIONAL INDUSTRIAL RATIONALIZATION IS LEADING TO ENERGY EFFICIENCY AND PRODUCTIVITY GAINS

CHALLENGES

The diversity of this sector makes it difficult for a single task force to advance the interests of all of the companies it represents. This presents a major challenge.

In addition, many manufacturers, especially smaller ones, lack the knowledge and financial resources to identify and act on the energy-saving opportunities available to them. Moreover, despite the recognized importance of improving energy intensity, the lack of staff and capital resources to dedicate to energy projects can be a significant impediment to manufacturers of all sizes.

ACTION REPORT

The 14 members participating in the new General Manufacturing Task Force are business, technological, environmental and energy efficiency leaders in their respective industries. As leaders, most of these companies exceed the current target of a 1 percent per year improvement in the energy intensity of their operations, a track record not necessarily typical of the sector as a whole.

The energy-saving performance of these companies varies. Some have made impressive gains that were achieved through investment in new technology. Others are "doing more with less" in restructured organizations. Still others are recognizing the importance of energy issues and are starting on the road to improved efficiency by instituting energy consumption measurement and management programs.

Kindred Industries, a division of Emco Ltd., is an excellent example of the value of a comprehensive energy management approach. Kindred has converted all plant heating to radiant tube technology and switched offices to rooftop heating and gas air make-up units. The company is also replacing its fire tube boiler with a gas-fired unit, installing new, energy-efficient motors and modernizing its lighting and will soon install new capacitors to better control its power factor. The impact on costs has been dramatic. From 1992 to 1997, Kindred reduced its natural gas bill by 37 percent while doubling production.

The restructuring of many manufacturing industries has had a major impact on energy intensity. Faced with the need to broaden their markets beyond Canada's borders, many manufacturers have been more closely integrated with their U.S. counterparts or have developed alliances with foreign producers. This trend has led to the transnational rationalization of production, with plants producing longer runs of a narrower range of products. Not only has this trend resulted in substantial productivity gains, it has also led to an improvement in energy intensity.

ACHIEVEMENTS

Since the launch of the General Manufacturing Task Force in early 1998, the group has held five meetings and is making progress in efforts to establish the sector's scope and goals. Many of the 14 companies on the task force have become Industrial Energy Innovators and registered members of the VCR Inc.

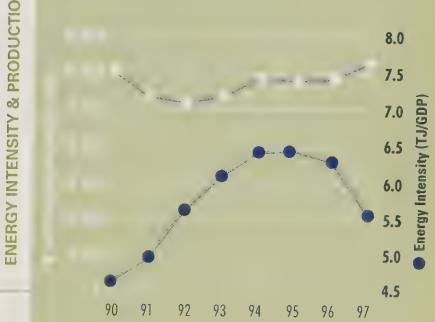
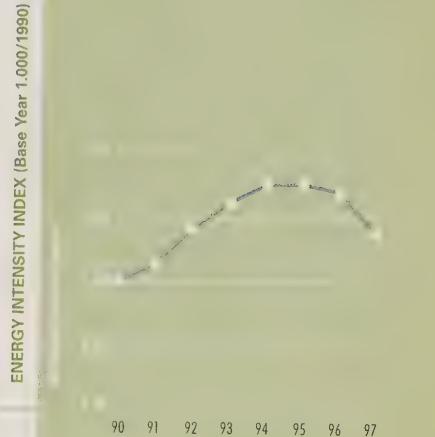
OBJECTIVES & TARGETS

As a new sector leader, the task force is establishing communications with peer manufacturers, suppliers and customers, informing each about the environmental, social and economic benefits of energy efficiency, and building their support and commitment. It is clear to task force members that taking up Canada's challenge to improve energy intensity is not only a worthwhile national goal, but a significant step toward building a more cost-effective business.

ENERGY INTENSITY INDEX (Base Year 1,000/1990)

ENERGY INTENSITY & PRODUCTION

ENERGY SOURCES IN TERAJOULES (TJ)





PERFORMANCE HIGHLIGHTS

- ➲ FIRST CANADIAN LIME INSTITUTE ENERGY EFFICIENCY WORKSHOP HELD IN NOVEMBER 1998
- ➲ ENERGY CONSUMED PER TONNE OF PRODUCTION IS STEADILY DROPPING
- ➲ GLOBAL STONE MODIFIES KILN DESIGN TO IMPROVE QUALITY, CAPACITY AND FUEL EFFICIENCY

Canada's commercial lime producers, represented by the Canadian Lime Institute, are active participants in an ongoing effort to reduce the energy component in their products. Merchant lime producers operate from 15 producing sites staffed by 650 employees. Since 1990, these companies have combined to increase tonnage production by 24 percent while steadily reducing the energy consumed per tonne. Over the last six years, the industry has maintained an energy intensity approximately 10 percent lower than the index for 1990.

Natural gas is the principal fuel used, with coke and coal making up most of the balance. While total energy consumed rose 1528 TJ between 1990 and 1997, the industry has improved its energy intensity per tonne.

CHALLENGES

The lime sector's drive for energy efficiency faces a number of obstacles. Finding technology that will improve the energy efficiency of the calcining process essential to lime production remains difficult, as is acquiring the capital funding needed to make major facility improvements. While fuel switching holds some promise, locating available and feasible alternative fuels with better environmental characteristics can be difficult. The members of the Canadian Lime Institute continue to search for solutions; however, finding qualified people to staff energy efficiency projects remains a significant challenge.

ACTION REPORT

The lime sector's key industry association, the Canadian Lime Institute, is an active supporter of energy efficiency. In November 1998, the institute held its first Energy Efficiency Workshop, an event designed to help members improve the way they use energy in their operations.

Individual sector members continued to invest in energy efficiency. For example, in 1997, Global Stone modified the burner and charging systems and expanded the capacity of its three shaft kilns. These improvements reduced energy consumption in the kilns from 6.6 GJ/t to 5.5 GJ/t of lime produced. Global Stone also revised its blasting operations, purchasing a new blast hole drill that delivered a net gain of 70 percent in energy efficiency.

ACHIEVEMENTS

Sector-wide, year-over-year lime production increased 19.3 percent from 1990 to 1997 while energy consumption per unit of output declined by 11 percent.

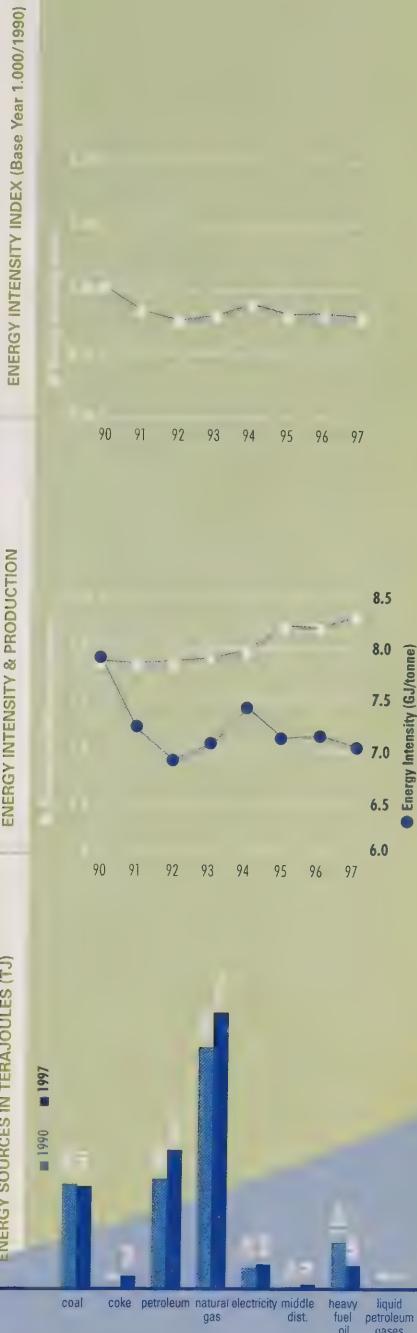
OBJECTIVES & TARGETS

The sector's energy efficiency target is to reduce the energy consumed per unit of output by 0.3 percent to 0.5 percent per year through the year 2000. The Canadian Lime Institute is currently reviewing this target and will set new targets in 1999 for the ensuing years.

ENERGY INTENSITY INDEX (Base Year 1,000/1990)

ENERGY INTENSITY & PRODUCTION

ENERGY SOURCES IN TERAJOULES (TJ)





PERFORMANCE HIGHLIGHTS

- ➲ IMPLEMENTING ENERGY-MONITORING TECHNOLOGY, INFORMATION SYSTEMS, AWARENESS TRAINING AND OPERATIONAL ASSESSMENT PROCESSES
- ➲ INDUSTRY IS LINKING ENERGY MANAGEMENT TO STRATEGIC BUSINESS OBJECTIVES
- ➲ MAC ENERGY TASK FORCE SPONSORS CIEEDAC AND STUDY ON ENERGY BENCHMARKING

Canada's mining sector is not only the foundation of industrial production, but its mines are also often the economic backbone of the communities and regions in which they operate. In 1997, the value of mineral production totalled about \$19 billion, or 3.8 percent of Canada's GDP.

Canada is one of the world's largest mineral exporters, with approximately 80 percent of its minerals and metal products, valued at \$44.4 billion, produced for the export market. In total, Canada's exports of minerals and metals represent 15 percent of total domestic exports and 26 percent of Canada's 1997 trade surplus. A combination of soft export markets, rising inventories, the Asian financial crisis and plummeting metal prices has led to a 2.3 percent drop in the value of Canada's metal production. Similarly, operating profits for the metals industry were \$2.1 billion in 1997, a decrease of roughly 5 percent compared to 1996. Overall, the mining industry's revenues and production value reflect global metal market movements.

There were 221 metal and non-metal mining establishments operating in Canada in 1997, directly employing 48 841 people on an annual payroll of more than \$2.5 billion. The mining industry's energy mix is heavily weighted toward electricity at 44 percent of the total energy demand. Heavy fuel oil and distillates satisfy most of the remaining energy requirements. An active program of fuel-switching in the industry since 1990 has led to substantial reductions in the use of coal.

CHALLENGES

A significant drop in international metal prices throughout 1997 and 1998 has constrained capital investment and encouraged measures to reduce production costs. With energy representing between 10 and 25 percent of production costs, energy efficiency remains an important part of the industry's overall competitiveness and strategy.

The Mining Association of Canada (MAC) will continue to pursue programs to assist the industry with its energy efficiency efforts. The association's major challenge is to make energy efficiency a priority for each of its members. To meet this challenge, MAC is developing a comprehensive policy on climate change and energy efficiency. The association is also actively involved in energy efficiency communication efforts to encourage participation, enhance information sharing and increase awareness among its members. Its goal is 100 percent member participation.

ACTION REPORT

Many mining companies have made significant energy efficiency improvements. Cominco Ltd., for example, has recently completed a modernization project at Trail, British Columbia. The new Kiveet lead smelter will substantially cut the amount of fuel (coke and coal) needed for heating and reduction. The company has also installed a computerized steam management system and is looking at opportunities to alter process controls to reduce waste steam.

INCO Ltd.'s Ontario Division has improved its energy efficiency performance by an average of 2 percent per year since 1980 while its Manitoba Division is meeting its improvement target of 1 percent per year per unit of output. Iron Ore Company of Canada has acquired 11 fuel-efficient locomotives to transport ore from Labrador City to Sept-Îles, Quebec, automated its induration furnaces, identified ways to reduce the energy needed to heat process water and replaced its two dry mills with a more energy-efficient wet mill.

Noranda Inc. has launched programs at its Horne and Gaspé, Quebec, operations that have substantially reduced energy consumption. Syncrude Canada Ltd. plans to invest more than \$1 billion over the next decade in more energy-efficient processes and equipment. Placer Dome North America Ltd. has introduced numerous programs that have achieved major reductions in power consumption at its Musselwhite and Campbell mines.

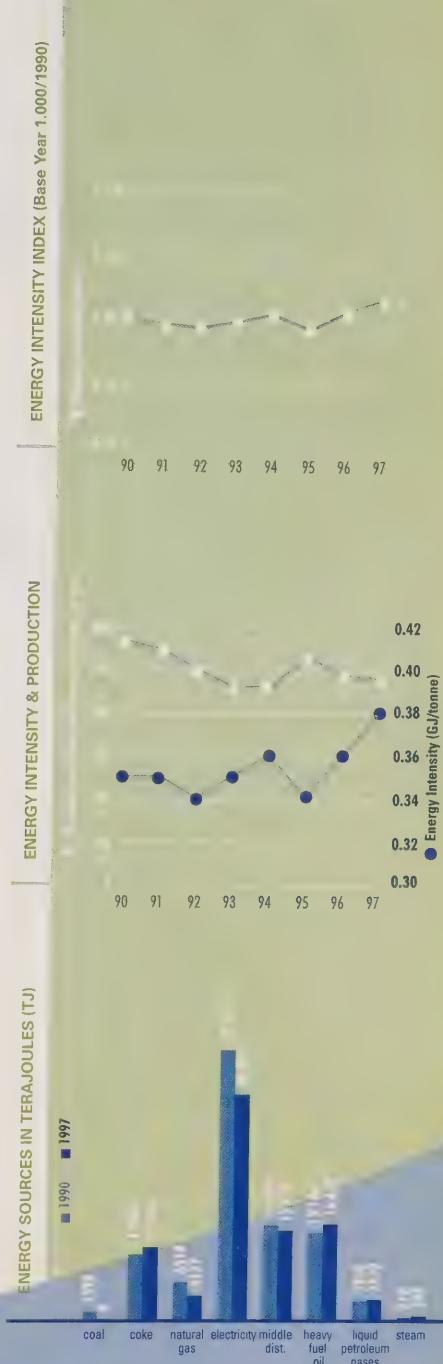
ACHIEVEMENTS

- ① MAC's efforts to increase industry participation in the VCR Inc. have helped to foster greater awareness of the value of energy efficiency among its members. Some members have appointed energy managers and introduced new monitoring technology. MAC's Mining Energy Efficiency Planning Guide and its recently launched Mine Energy Managers Network and Internet Chatline are supporting companies in their energy efficiency initiatives. MAC's first annual Mine Energy Efficiency Workshop and Conference will further advance the energy efficiency cause.
- ② The association is sponsoring CIEEDAC to review, collate and analyse existing energy databases to verify data, eliminate errors and resolve inconsistencies. MAC has also signed a three-year contract with NRCan to improve energy efficiency in mining. The agreement includes international benchmarking, developing case studies and other process efficiency initiatives.

OBJECTIVES & TARGETS

The mining sector has set as its target a 1 percent per year improvement in energy consumption per unit of output, stabilizing at 1990 levels by the year 2000. In addition, the sector has set specific objectives. These include:

- gaining senior management commitment to energy efficiency
- establishing an energy champion in each organization
- instituting a quantifiable baseline year and a forecast of achievable reductions
- establishing goals to achieve specific improvements and providing innovative actions to meet these goals
- designing energy-monitoring systems
- analysing the impact of actions
- implementing continuous reporting
- improving employee education and awareness



OIL SANDS



Canada's two oil sands plants in northern Alberta and one heavy oil upgrader in Saskatchewan together produce more than 300 000 barrels per day of synthetic crude oil for markets in Canada and the United States. The sector directly employs 20 000 people, with economic spinoffs indirectly creating another 100 000 jobs.

In 1997, the oil sands sector continued to improve its energy efficiency, reducing the energy consumed per unit of production to 9409 GJ/m³, a 4 percent improvement compared to 1996.

CHALLENGES

PERFORMANCE HIGHLIGHTS

- ⦿ ENHANCED PLANT RELIABILITY, WASTE HEAT RECOVERY AND PROCESSING UNIT YIELDS ARE DRIVING ENERGY USE IMPROVEMENTS
- ⦿ NEW MINING AND EXTRACTION TECHNOLOGIES ARE IMPROVING ENERGY EFFICIENCY
- ⦿ ENERGY INTENSITY IN 1997 IMPROVES 14 PERCENT OVER 1990
- ⦿ TOTAL ENERGY CONSUMPTION DECLINES IN 1997 FOR THE FIRST TIME

Reducing the energy component in oil sands production is a direct result of the introduction of innovative technologies. As production increases, better, less energy-intensive extraction methods must be implemented and material handling systems must be modified to efficiently accommodate greater loads. Unfortunately, developing and implementing improved processes, equipment and procedures is both time consuming and expensive. The long lead times and substantial investments required to introduce enhancements have made the march toward greater energy efficiency a difficult journey.

ACTION REPORT

The industry continues to implement measures that deliver on its commitment to reduce energy intensity and increase efficiency. Improvements are coming through a combination of operational excellence and technological innovation. Plants have improved the reliability of their operations and introduced programs to recover waste heat and improve yields through more efficient processing. They have achieved additional gains by introducing new technologies in the mining and extraction stages. The industry's proven capabilities in research and development, capital investment, managerial leadership and employee commitment are key assets in its significant success to date and its projected improvements in the future.

ACHIEVEMENTS

- 1 While total annual production has risen 56 percent since 1990, energy use has risen only 33 percent. In 1997, year-over-year energy consumption declined for the first time, totalling 174 939 TJ, a 3.5 percent decrease compared to 1996. Compared to 1996, energy intensity improved 4.6 percent in 1997, with a total improvement of 14 percent since 1990.
- 2 Along with improving their energy efficiency, oil sands industry members are actively involved in fuel switching. The industry's principal focus is to reduce the use of coke by switching to natural gas.

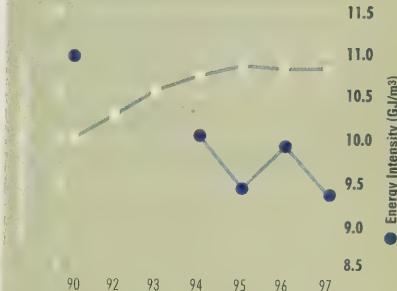
OBJECTIVES & TARGETS

The oil sands sector has targeted a minimum average improvement in energy efficiency per unit of production of 1 percent per year.

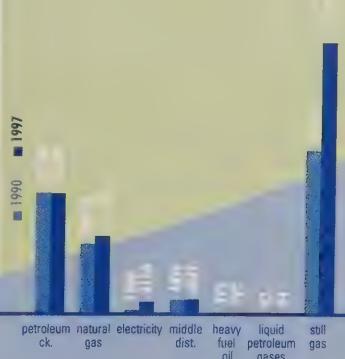
ENERGY INTENSITY INDEX (Base Year 1,000/1990)



ENERGY INTENSITY & PRODUCTION



ENERGY SOURCES IN TERAJOULES (TJ)



PETROLEUM PRODUCTS



PERFORMANCE HIGHLIGHTS

- ❖ PRODUCTION INCREASES 2.3 PERCENT IN 1997 BUT ENERGY INTENSITY DECLINES
- ❖ TOTAL ENERGY CONSUMPTION DOWN 8 PERCENT SINCE 1990
- ❖ REFINERIES MAKE MAJOR INVESTMENTS IN ENERGY EFFICIENCY
- ❖ ENERGY USED PER UNIT OF OUTPUT DECLINES 2.2 PERCENT IN 1997
- ❖ ENERGY INTENSITY IMPROVED 13 PERCENT SINCE 1990
- ❖ CO₂ EMISSIONS 3 PERCENT BELOW 1990 LEVELS

CHALLENGES

The demand for petroleum products is expected to increase in step with population and economic growth, putting pressure on the industry to increase its use of energy. While the industry continues to exceed its commitment of a 1 percent annual improvement in energy intensity, pressures for increased production will make ongoing improvements more challenging. Fortunately, higher capacity utilization improves refinery efficiency, thereby lowering the energy required per unit of output. In 1997, capacity utilization was 89 percent, compared to 87 percent in 1996.

The industry also faces increasing pressure to reduce the sulphur levels in gasoline. Meeting increasingly stringent sulphur content requirements will require refineries to employ more energy-intensive methods, processes that make it more difficult and expensive to reduce CO₂ emissions.

ACTION REPORT

A number of refineries invested substantial capital in improvements that enhance energy efficiency:

- Petro-Canada installed a new heat exchanger on the hydrocracking unit at one of its refineries, a move that will recover waste energy and reduce fuel use in its reboiler furnace. The project, which cost \$750 000, will save about 90 TJ in energy, reduce CO₂ emissions by 4000 t and net about \$250 000 in savings each year.
- Chevron installed a new waste heat boiler and pump-around heat exchanger at one of its refineries and introduced additional online monitoring of its processes. An investment of \$9 million will reduce energy consumption by 315 terajoules per year and save between \$600 000 and \$800 000 annually.
- Another refinery installed an economizer to capture waste heat from flue gas heaters and cut the energy needed to produce high-pressure steam for its refining operations. This improvement will save about \$1 million and reduce CO₂ emissions by 20 000 t each year.

- A \$20 million heat integration project at another refinery will reduce fired electrical costs by more than \$2 million per year.
- In addition, a new, online energy-monitoring system now enables refinery operators to scan a series of computer screens to identify significant changes in energy consumption throughout the plant. Refineries that install the new system can expect to recover their \$100 000 investment through energy savings in the first year of operation.

ACHIEVEMENTS

Production of petroleum products grew in 1997 while the industry's energy intensity decreased. In 1997, the sector's Energy Intensity Index stood at 94.5, a 4.8 percent improvement since 1996 and 16.4 percent better than 1990. This exceeds the industry's commitment of a 1 percent per year improvement. Between 1996 and 1997, energy consumption decreased by approximately 6000 TJ, or 2.2 percent. This represents an 8 percent improvement since 1990. Energy intensity decreased by 4.3 percent to 2.62 GJ/m³, or a 13 percent improvement since 1990.

Between 1996 and 1997, energy consumption remained about the same. However, 1997 energy used per unit of output, as measured in gigajoules per millions of 1986 dollars of GDP, improved by 2.5 percent over 1996.

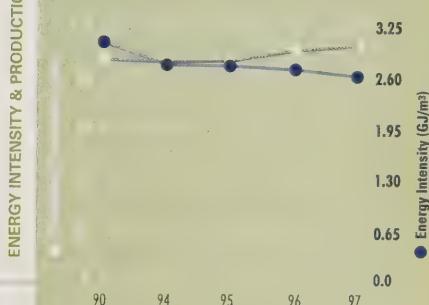
OBJECTIVES & TARGETS

The petroleum refining industry is committed to a 1 percent per year improvement in energy intensity as measured by the Solomon Energy Intensity Index through the year 2000. This target will be reviewed during 1999.

ENERGY INTENSITY INDEX (Base Year 1,000/1990)

90 94 95 96 97

ENERGY INTENSITY & PRODUCTION



ENERGY SOURCES IN TERAJOULES (TJ)

1997

1990

petroleum
ck. natural
gas electricity middle
dist. heavy
fuel oil liquid
petroleum
gases steam still gas

PULP and PAPER



PERFORMANCE HIGHLIGHTS

- ⚡ CONSUMPTION OF PURCHASED FUEL PER TONNE OF PRODUCT IS LOWER THAN IN 1990 IN OVER 55 PERCENT OF MILLS
- ⚡ TOTAL ENERGY CONSUMPTION DECREASED IN 1997/1998
- ⚡ CONSUMPTION OF FOSSIL FUEL AND ELECTRICITY GENERATED FROM FOSSIL FUELS HAS DECREASED SIGNIFICANTLY SINCE 1990
- ⚡ USE OF BIOMASS FUEL HAS INCREASED

Canada's pulp and paper industry is a major contributor to Canada's economy. Its 162 facilities employ 65 000 workers. The sector represents about 2.5 percent of Canada's GDP, with nearly 84 percent of its production exported.

Pulp and paper is a key component of Canada's closely linked forest products industry. Besides pulp, the sector includes the newsprint, paper board, building board and other paper subsectors.

The pulp and paper sector's total production rose to 33 477 kt in 1997. Thanks to an ongoing switch to biomass fuel sources, considered CO₂ neutral by the International Panel on Climate Change, the industry is limiting increases in the use of less environment-friendly fossil fuel sources despite expanding production. The use of biomass, including wood waste and pulping liquor, has risen from 367 914 TJ in 1990 to 407 116 TJ in 1997. Over the same period, heavy fuel oil use has been reduced.

While production has risen by more than 30 percent since 1990, energy usage exclusive of biomass has increased by less than half. Compared to 1990, the industry in 1997 achieved an overall improvement in energy intensity of about 15 percent.

CHALLENGES

Pulp and paper is heavily exposed to the whims of international markets. Although the sector's capacity utilization rate rose from 87.9 percent in 1996 to 91.2 percent in 1997, the industry continues to face production curtailments that negatively affect operating and energy efficiencies. Restrictions on capital spending are a challenge for companies seeking to introduce further programs to reduce greenhouse gas emissions.

While the pulp and paper sector sees opportunities for improved energy efficiency through cogeneration, limited support from utilities and governments has kept the industry from implementing cogeneration to its full potential.

ACTION REPORT

In 1997, the Canadian Pulp & Paper Association (CPPA) commissioned a study to explore the expanded use of surplus wood residue as a fuel for pulp and paper production. The CPPA also revised its energy-monitoring report to incorporate 1990 as the base year to measure energy intensity improvements and to develop more comprehensive information on the amount of electricity the industry generates through cogeneration. The association remains active on several committees involved in the climate change consultative process.

At the mill level, companies continue to introduce energy intensity improvements and have implemented programs to switch from fossil fuels to biomass. For example, to enable increased fuel switching:

- Dottonnear Inc. has installed an overfire burner on the bark boiler at its Windsor, Quebec, mill.
- Weldwood of Canada Ltd. replaced the power boiler grate and superheater at its Cariboo Pulp and Paper plant in British Columbia, reducing natural gas consumption by 700 TJ per year.
- Canadian Forest Products Ltd.'s Howe Sound Pulp and Paper division installed hog fuel presses to reduce the moisture content in the wood residue it burns, improving burning efficiency.
- EE Soucy Inc. in Rivière-du-Loup, Quebec, and Repap New Brunswick Inc. in Miramichi, New Brunswick, have introduced improvements to their fuel conditioning and feeding systems to produce dryer, more efficient biomass fuel.
- Kruger, Inc.'s Corner Brook, Newfoundland, mill installed a new boiler to burn wood residue and wastewater treatment sludges.
- Noranda Forest Inc.'s Edmundston, New Brunswick, mill completed construction on a new wood-fired cogeneration plant.
- Weyerhaeuser Canada Ltd. in Prince Albert, Saskatchewan, modified and improved its hog fuel handling systems.
- MacMillan Bloedel's mills in Port Alberni and Powell River, British Columbia, switched to fluidized bed boilers, reducing greenhouse gases by 100 kt of CO₂ per year.
- Stora Port Hawkesbury Ltd., in Point Tupper, Nova Scotia, installed waste liquor concentrators that enable the firing of waste liquor and eliminate the use of light oil in the recovery boiler.

ACHIEVEMENTS

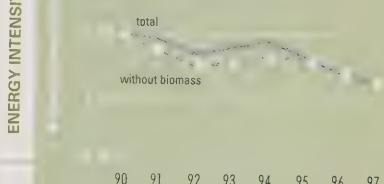
From 1990 to 1997, total energy consumption per unit of output decreased from 28.83 GJ/t to 24.58 GJ/t. Over the same period, the consumption of fossil fuel and electricity (excluding biomass) decreased from 14.48 GJ/t to 12.42 GJ/t. Production-based indices for 1997 reflect these reductions. That year's index for total energy is 0.853, while fossil fuel and electricity show an index of 0.858. It should be noted that the sector's 1990 energy consumption total has been adjusted to 739 086 TJ from the total of 747 055 TJ previously reported by CIPEC.

Since 1990, the portion of total energy supplied by biomass decreased slightly from 49.8 percent to 49.5 percent in 1997. However, over the same period, the use of purchased fuel per tonne of output is lower in over 55 percent of the industry's mills.

OBJECTIVES & TARGETS

The pulp and paper sector is committed to a 1 percent per year reduction in energy consumption through the year 2000. Further implementation of fuel-switching programs and the greater use of biomass waste fuels will enable the industry to move toward this goal. However, the industry's heavy dependence on exports and international market conditions in a cyclical business makes it difficult to establish targets for the following years.

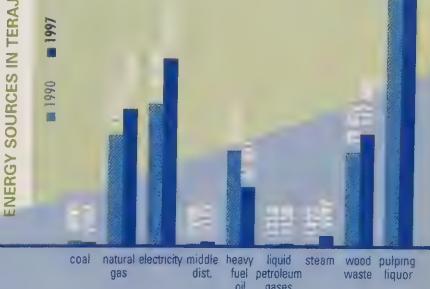
ENERGY INTENSITY INDEX (Base Year 1,000/1990)



ENERGY INTENSITY & PRODUCTION



ENERGY SOURCES IN TERAJOULES (T.J.)





PERFORMANCE HIGHLIGHTS

- ⚡ ENERGY INTENSITY IMPROVED IN 1996 AND 1997
- ⚡ THE RUBBER ASSOCIATION MAINTAINS AN INDUSTRY-WIDE ENVIRONMENTAL TRACKING GRID
- ⚡ THE ASSOCIATION IS WORKING WITH LOCAL AUTHORITIES TO ESTABLISH SCRAP TIRE STEWARDSHIP BOARDS
- ⚡ FUTURE IMPROVEMENTS WILL COME FROM SMALL VICTORIES BY INDIVIDUAL MANUFACTURERS
- ⚡ THE SECTOR CONTINUES FUEL-SWITCHING
- ⚡ ORGANIZED AND SPONSORED RUBBER RECYCLING '98

The tires, tubes, hoses and belts manufactured by Canada's rubber sector are vital components for the automotive industry in Canada and around the world. To meet demand for its products, the rubber products industry employs close to 18 000 people in 175 facilities nationwide, providing a total payroll of more than \$600 million annually.

Rubber industry production rose from 195 000 t in 1990 to 210 000 t in 1997. Total energy consumption was up slightly over the same period, rising from 9115 TJ in 1990 to 10 585 TJ in 1997. Total energy consumption remained relatively stable between 1990 and 1993 largely due to a recession in the automotive industry but has risen substantially since 1995 as the auto industry rebounded.

Physical production figures for the rubber products sector are used for the first time in the 1998 CIEEDAC Report to calculate energy intensity. These figures show that the industry's Energy Intensity Index ratio rose between 1990 and 1995, then decreased in 1996 and 1997. This recent decline reflects the early impact of the sector's long-term plan to reduce energy use.

According to the industry's own environmental tracking system, over 50 percent of the industry's energy requirements are filled by natural gas, 35 percent by electricity and nearly all of the rest by heavy fuel oil.

CHALLENGES

The rubber sector is made up of both large multinational companies operating efficient, modern plants and small, local firms. While larger firms have the financial muscle to make ongoing investments in energy efficiency, smaller firms have mixed financial abilities. The majority of the sector's future energy efficiency improvements will come from smaller, less efficient firms. However, these companies represent a relatively small percentage of the industry's total output, and the improvements they make will not have a major impact on measurements of the industry's overall performance.

Most of the rubber industry's production is earmarked for the automotive industry. Suppliers to the automotive industry are under constant pressure to improve quality and lower costs. This makes the effort to reduce energy consumption an ongoing activity. North American vehicle sales and an undervalued Canadian dollar have led to high levels of rubber product production in recent years, helping to lower energy consumption per unit of output. If demand declines, these gains will be difficult to maintain.

Complicating industry activities is the need to comply with some 14 federal and provincial environmental programs, several of which have conflicting requirements.

ACTION REPORT

As the industry's principal voice, the Rubber Association of Canada plays a crucial role in environmental issues. A strong believer in responsible care of the environment, the association is working with local authorities to establish provincial scrap tire stewardship boards. It also sponsors a biannual international symposium on rubber recycling as a means of encouraging the commercial development of this fragile, emerging industry. The association has established and maintains an industry-wide environmental tracking grid to measure the overall performance of the rubber manufacturing sector and to enable plant managers to benchmark individual plant performance against the industry. All of these activities have energy consumption and air quality implications. By focusing the industry's attention on environmental issues, the association is playing a critical role in the long-term move toward improved energy intensity and reduced greenhouse gas emissions.

ACHIEVEMENTS

The rubber sector has had notable success in improving its energy intensity record compared to the 1990 base year. The sector believes that future achievements will result from small victories emerging from the efforts of individual manufacturers to continuously upgrade their energy, cost and environmental performance.

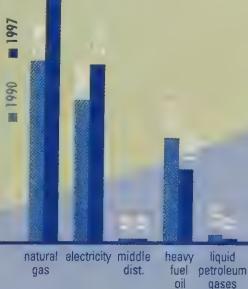
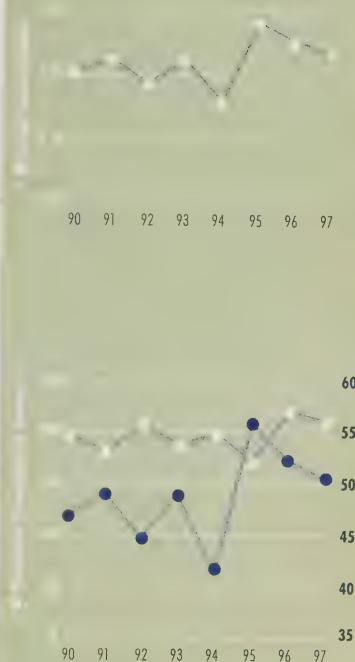
OBJECTIVES & TARGETS

Improvements in energy intensity vary considerably across the rubber sector. The Rubber Association of Canada is focused on supporting its member companies as they develop and implement individual energy usage programs. While the majority of its members now participate in the industry's environmental measurement and tracking system, the association will continue in its efforts to achieve total participation.

ENERGY INTENSITY INDEX (Base Year 1.000/1990)

ENERGY INTENSITY & PRODUCTION

ENERGY SOURCES IN TERAJOULES (TJ)



SOFT DRINK



PERFORMANCE HIGHLIGHTS

- ⚡ THE CANADIAN SOFT DRINK ASSOCIATION'S TECHNICAL COMMITTEE MET WITH CIPEC TO EXPLORE WAYS TO ASSIST MEMBERS WITH THEIR EFFORTS TO IMPROVE ENERGY EFFICIENCY AND REDUCE GREENHOUSE GAS EMISSIONS
- ⚡ PEPSI IMPLEMENTED AN ENERGY EFFICIENCY INITIATIVE AT ITS MISSISSAUGA, ONTARIO, PLANT
- ⚡ CAPE BRETON BEVERAGES IS MAKING ONGOING INVESTMENTS TO IMPROVE THE ENERGY EFFICIENCY OF ITS OPERATIONS
- ⚡ SOFT DRINK MAKERS HAVE REDUCED THE ENERGY COMPONENT IN PACKAGING BY TURNING TO LIGHTER WEIGHT, RECYCLABLE MATERIALS SUCH AS PET PLASTIC AND ALUMINUM

The Canadian soft drink sector is made up of 20 bottling plants producing carbonated, non-alcoholic beverages. Soft drink bottlers provide direct employment for 8000 Canadians and support a total annual payroll of \$360 million. Soft drinks make up about one-third of the \$4.4 billion in beverages that Canadians purchase in supermarkets each year.

ACTION REPORT

In 1997, the Canadian Soft Drink Association renewed its relationship with CIPEC. The association's technical committee met with CIPEC to explore ways it could assist its members with their efforts to improve energy efficiency and reduce greenhouse gas emissions.

Individual bottlers continue to take steps to boost energy efficiency at their plants. Energy Innovator Pepsi, for example, has implemented an energy efficiency initiative at its Mississauga, Ontario, plant. The company installed a computer system to control the start-up sequences of major motors and pumps running the plant's air compressors, boilers, HVAC, space heaters and battery chargers. Pepsi's \$118 000 investment in the new system was recovered in energy cost savings in less than a year, and the company expects to benefit from annual savings of \$137 000.

Cape Breton Beverages is replacing the ballasts and lighting systems in its 40 000 square foot bottling plant with more energy-efficient units. The company has also installed programmable thermostats, saving energy by reducing building heat during off hours. Committed to vigilant monitoring, control and maintenance of its plant systems, the company is making ongoing investments to improve the energy efficiency of its operations.

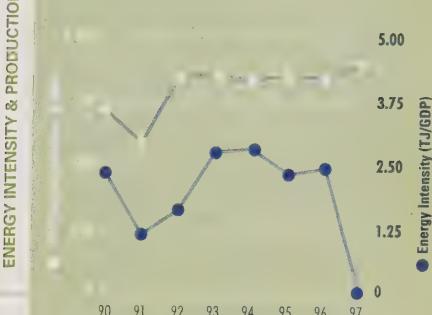
ACHIEVEMENTS

The soft drink sector takes a broad perspective on the energy consumed to bring its products to market. This approach has led the industry to adopt alternative packaging strategies that are more environment-friendly as well as less energy-intensive. In addition to slashing the volume of packaging waste destined for landfill by 67 percent since 1988, soft drink makers have reduced the energy component in packaging by turning to lighter weight, recyclable materials such as PET plastic and aluminum. Moreover, today's PET containers are 21 percent lighter and aluminum cans are 65 percent lighter than their counterparts were 20 years ago. Lighter containers require less volume of material to produce (hence less energy), and by lowering the overall weight of product shipments, they reduce the transportation fuel needed to bring beverages to market.

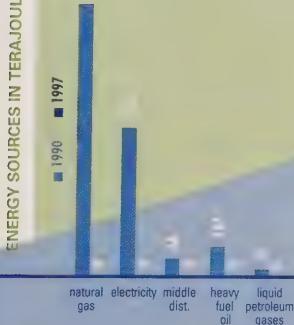
ENERGY INTENSITY INDEX (Base Year 1,000/1990)



ENERGY INTENSITY & PRODUCTION



ENERGY SOURCES IN TERAJOULES (TJ)





PERFORMANCE HIGHLIGHTS

- ⚡ STEEL INDUSTRY EXTENDS ITS ENERGY EFFICIENCY TARGET TO YEAR 2010
- ⚡ IMPRESSIVE ENERGY INTENSITY IMPROVEMENT OF 19 PERCENT BETWEEN 1990 AND 1997
- ⚡ IMPROVED ENERGY INTENSITY AND REDUCED CARBON INTENSITY HAVE AVOIDED 4.26 MILLION TONNES OF CO₂ EMISSIONS
- ⚡ CO₂ EMISSIONS PER TONNE SHIPPED HAVE BEEN CUT BY 23 PERCENT BETWEEN 1990 AND 1997

Canada's steel sector is one of the country's largest industries, generating sales of \$11 billion and \$3.6 billion in exports in 1997 alone. A strong growth trend in production and sales continued in 1997, with the industry shipping 14.5 Mt compared to 1996 shipments of 14.1 Mt. Steel production has a major impact on the Canadian economy. The industry's 17 steelmaking plants and 20 downstream production facilities directly employ 33 400 workers and support a total of 150 000 jobs across the country.

CHALLENGES

Steelmaking in Canada is a technologically advanced capital-intensive industry requiring constant innovation and investment. Although North American markets are closely integrated, U.S. steelmakers continue to resist a continental open market for steel products. This has led to trade barriers that inhibit the competitive position of Canadian companies in U.S. markets. Conversely, excess capacity elsewhere in the world, often sustained through government subsidy, has led to the dumping of steel in North American markets. The combination of U.S. market limits and unfair international competition erodes prices, thus reducing profitability, employment and the funds available to Canadian firms for investment in energy efficiency.

The Canadian steel industry supports open, market-driven trade with the United States as well as legislative and other measures to end unfairly traded imports. The industry also supports macro-economic policies that restrain inflation, generate competitive interest rates and make Canada an attractive place to invest. Fair and open trade will enable the industry to generate the money needed for investment in major capital and technology turnover projects that would create significant improvements in energy intensity.

ACTION REPORT

Canada's steelmakers continued to emphasize energy efficiency in their investment and upgrade programs in 1997 and 1998.

Stelco's McMaster Ltée installed equipment to improve tap-to-tap times, increase electric arc furnace efficiency and increase the speed of its continuous casting system, thus allowing it to produce more steel with the same amount of energy.

AltaSteel has improved standard operating and maintenance programs, introduced more advanced process controls and installed a computerized numerical control lathe, ladle refining furnace and automatic bar bundling facility. These innovations will reduce energy waste while improving manufacturing yields and plant productivity.

Dofasco undertook energy efficiency improvements in several business units. Measures taken in its coke production facility have led to annual energy reductions of over 1000 TJ.

Lake Erie Steel continued its blast furnace fuel-switching program and, along with other actions, reduced the energy used to produce a tonne of hot rolled steel by 5 percent. This has helped build a total reduction of 29 percent since 1990.

Stelwire introduced more efficient lighting and improved steam systems at its Parkdale Works and introduced improved process controls at its Burlington Works.

The Canadian Steel Producers Association (CSPA), with the Canadian Steel Industry Research Association (CSIRA), is identifying technological opportunities to improve energy efficiency and reduce emissions. A consortium of Canadian companies is developing a product that uses slag as a raw material for concrete. A similar group is working with Porsche Engineering to develop a passenger car autobody 35 percent lighter than current models.

ACHIEVEMENTS

Members of the CSPA are active participants in voluntary programs to improve energy efficiency and reduce emissions. The industry has made excellent progress in reducing its energy intensity and is making a solid contribution to CIPEC and the VCR Inc.

- 1 Since 1990, through voluntary action, the industry has achieved a 19 percent reduction in energy consumed per tonne shipped, a 7 percent reduction in total energy consumed and a 12 percent reduction in absolute CO₂ emissions despite a growth in shipments of more than 15 percent. The average annual energy intensity improvement from 1990 through 1997 is 2.7 percent, exceeding the industry's commitment of 1 percent per year.
- 2 In June 1998, the CSPA published its *Environmental Statement of Commitment and Action*, a document that summarizes the industry's approach to environmental management issues. CSPA members are committed to a process of continuous improvement, and the association will report annually on the industry's progress.

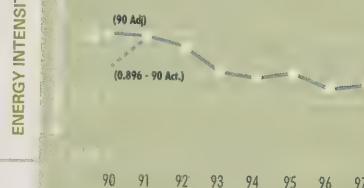
OBJECTIVES & TARGETS

In 1998, in response to the Kyoto Protocol, the Canadian steel industry extended its original climate change commitment to the year 2010. The industry is committed to an average reduction in energy consumption per tonne of steel shipped of 1 percent per year, averaged over the 20 years ending in 2010. This reduction is based on the 1990 adjusted rate of 21.18 GJ/t shipped. The adjustment was necessary to account for major labour disruptions in 1990.

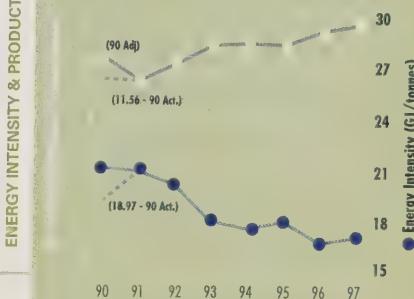
The industry is seeking "90/90" member participation as Industrial Energy Innovators—the commitment of 90 percent of all companies in the sector which, when combined, represent 90 percent of total steel production. Current participation is approximately 80 percent.

The trend continues in the industry toward less carbon-intensive energy forms, which according to estimates, offset production of over 950 000 t of CO₂ since 1990.

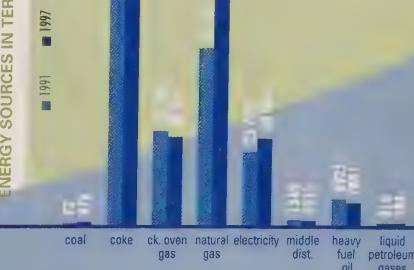
ENERGY INTENSITY INDEX (Base Year 1,000/1990)



ENERGY INTENSITY & PRODUCTION



ENERGY SOURCES IN TERAJOULES (TJ)





PERFORMANCE HIGHLIGHTS

- ⚡ CANADIAN TEXTILES INSTITUTE APPROVES TARGET OF A 10 PERCENT REDUCTION IN ENERGY USED PER UNIT OF OUTPUT FOR THE PERIOD 1995 TO 2000
- ⚡ 31 TEXTILE MANUFACTURERS JOIN INDUSTRIAL ENERGY INNOVATORS AND VOLUNTARY CHALLENGE AND REGISTRY INC.
- ⚡ MODEL PLAN DEVELOPED TO HELP COMPANIES REPORT THEIR ENERGY EFFICIENCY GAINS
- ⚡ PARALLEL SURVEY LAUNCHED TO TEST STATS CAN TEXTILE ENERGY DATA
- ⚡ DEVELOPED AND REVISED COMPREHENSIVE ENERGY ACTION PLAN
- ⚡ ONGOING CONSULTATION WITH STATS CAN AND NRCan TO IMPROVE ACCURACY OF TEXTILE ENERGY DATA

Canada's textile industry produces the fibres, yarns and fabrics used in industries as diverse as agriculture, automotive manufacturing, clothing, construction, environmental protection and road construction. The textile sector is organized into three subgroups: primary textiles, textile products and motor vehicle fabric accessories.

Combined, these groups operate more than 1000 facilities, employ close to 54 000 people and have a payroll of \$1.75 billion. The industry sells to 150 markets and exports close to 30 percent of its production.

Industry sales in 1997 totalled \$8.4 billion in 1986 dollars, an increase of 7.7 percent compared to 1996. Primary textiles showed an annual sales increase of \$384 million in 1997 while sales by the motor vehicle fabric accessories increased by \$37 million. Output in textile products reversed 1996 losses and rose by \$180 million in 1997. Since 1990, economic output has risen 20.7 percent, with a 28 percent gain in primary textiles, a 65 percent gain in motor vehicle fabric accessories, and a 2.5 percent decline in textile products.

The energy mix is heavily weighted toward natural gas (53 percent) and electricity (32 percent). Despite a substantial increase in output, total energy consumption as reported by Statistics Canada increased only slightly from 25 082 TJ in 1996 to 25 255 TJ in 1997. As a result of the industry's efforts to improve the accuracy of reporting by individual companies, Statistics Canada's 1997 data more accurately reflects the industry's actual experience. This view is supported by the 16.5 percent increase in total energy consumption between 1990 and 1997 compared to a 20.7 percent gain in economic output for the same period.

CHALLENGES

There are a number of challenges to improve energy efficiency. One challenge is to gain the active involvement of the industry's major producers as Industrial Energy Innovators. Energy Task Force members are now leading in efforts to broaden participation.

There is a need to develop methods that accurately measure energy use in all industry subsectors. This will lead to a more reliable portrayal of energy performance. Concurrently, significant efforts must be directed toward sensitizing the textile industry to the long-term implications of Canada's Kyoto commitments and encouraging active industry participation in the development of a new National Implementation Strategy for energy efficiency.

ACTION REPORT

To build sector awareness, manufacturers participating in the textile industry's Energy Task Force have agreed to demonstrate by example the individual economic benefits that can flow from effective energy efficiency programs at the company level.

All Task Force members have agreed to follow up directly and personally with the sector's Industrial Energy Innovators to review the progress made toward fulfilling their commitments.

Within the sector, individual companies report a number of capital investments and equipment modernization projects that are contributing to improved energy efficiency. One company has installed a "solar wall" in its facility to recover energy from the building and from the sun, thereby reducing the use of natural gas and electricity. Other companies are installing energy-efficient lighting and motors, heat reclaimer units and air leak monitoring systems and upgrading steam trap monitoring systems.

In 1998, the industry started its own energy survey to identify and correct inconsistencies and errors in the textile industry data currently available in government reports. More accurate information will enable the industry to establish better measures of its success in meeting energy efficiency targets. The industry survey of energy usage uses questions identical to the Statistics Canada *Industrial Consumption of Energy* (ICE) survey.

In addition to its own data-gathering activities, the industry, through the Canadian Textiles Institute, is providing a second year of financial support to the CIEEDAC at Simon Fraser University.

ACHIEVEMENTS

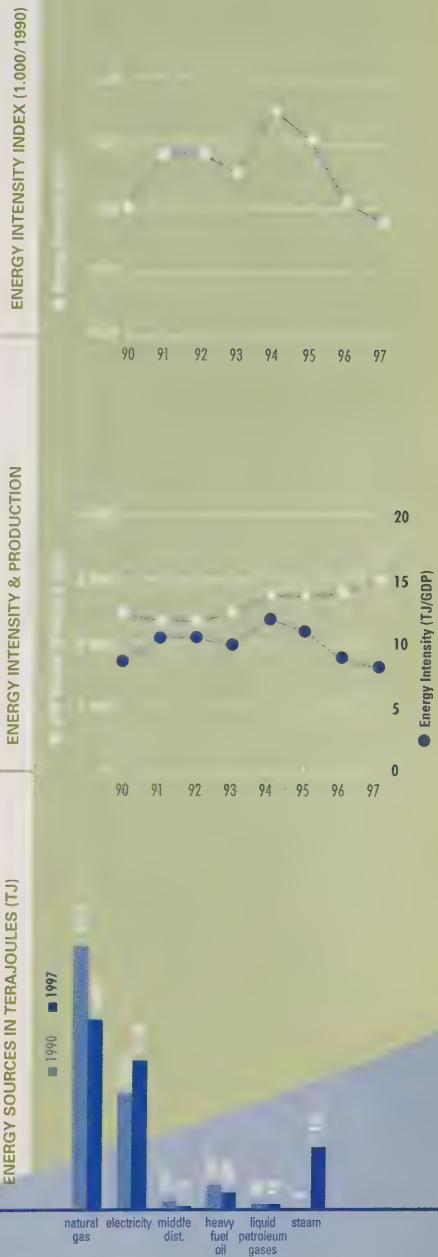
While the industry concentrates on expanding awareness and establishing a reliable base of energy efficiency data, a number of companies are providing excellent examples of the benefits of more efficient uses of energy. For example:

- ① St. Lawrence Corporation of Iroquois, Ontario, reports energy usage per unit of output in the first seven months of 1998 at 79 percent of comparable 1990 levels.
- ② LaGran Canada Inc. of Granby, Quebec, reports energy usage per unit of output for 1997 at 54 percent of 1990 levels.
- ③ Electricity usage per unit of output in 1997 at Fabrene Inc. of North Bay, Ontario, was 86 percent of 1990 levels.
- ④ Energy use per unit of output for all of Dupont Canada's manufacturing facilities was 73 percent of 1990 levels.

In 1998, the Textile Energy Task Force reviewed and extended the comprehensive action plan introduced in 1997. The task force agreed to concentrate on two principal goals: broaden the participation of textile manufacturers in Industrial Energy Innovators and the VCR Inc. and strengthen the commitment of existing Energy Innovators.

OBJECTIVES & TARGETS

The Canadian textile industry seeks a reduction in energy usage per unit of output of 2 percent per year between the years 1995 and 2000. In 1999, the industry will establish targets to cover the 2001–2005 and 2006–2010 periods. These new targets will build the textile industry's energy efficiency performance since 1995 and reflect results of ongoing consultations concerning a plan to meet Canada's Kyoto commitments.



TRANSPORTATION MANUFACTURING



PERFORMANCE HIGHLIGHTS

- ⚡ INDUSTRY-WIDE ENERGY CONFERENCE HELD IN 1998
- ⚡ CHRYSLER MISSISSAUGA PARTS DEPOT WINS ENERGY MANAGEMENT AWARD
- ⚡ FORD'S OAKVILLE ASSEMBLY PLANT LAUNCHES ENERGY COST MANAGEMENT AND ACCOUNTABILITY SYSTEM
- ⚡ GM HEATING AND OPTIMIZATION PROGRAM REDUCES POWER, STEAM AND COMPRESSED AIR USE
- ⚡ PRESSTRAK SWITCHES TO EFFICIENT NATURAL-GAS-DRIVEN COMPRESSORS
- ⚡ MONITORING AND RESTRUCTURING "PAYBACK FROM SAVINGS" PROJECT

The transportation manufacturing sector includes companies that assemble automobiles, trucks, buses and military vehicles as well as the parts, components and systems manufacturers which supply them. Canada's major automotive companies, including Cami, Chrysler, Ford, General Motors, Honda and Toyota, as well as parts manufacturers of all sizes, produce a wide range of automotive products for the domestic and export markets. Including dealer, parts and distribution networks, the sector employs more than a half million people across Canada and, in Ontario, accounts for one in six jobs and 20 percent of the provincial manufacturing GDP.

In 1997, the transportation manufacturing sector consumed 72 395 TJ of energy, up 36 percent since 1990. Over the same period, gross output increased 35 percent and GDP output increased 28 percent. The sector's energy efficiency in 1997 is comparable to 1990 levels.

Despite the industry's cyclical nature, Canadian motor vehicle production and the capital investments needed to support it have grown rapidly in the three decades since the *Canada-U.S. Auto Pact* was signed in 1965. Automakers acquire a large portion of their parts supplies from Canada, and they have allocated to Canadian plants a number of high-volume vehicle models and associated parts manufacturing. Foreign manufacturers have established highly competitive "greenfield" plants in Canada and have undertaken major expansion efforts to increase production capacity.

Within the sector, fuel splits have remained fairly constant, with natural gas (55 percent) and electricity (31 percent) making up the bulk of the energy used. Heavy oil use, at 1298 TJ, is equivalent to 1990 usage levels, while the use of coal has declined in real terms.

CHALLENGES

Canada's automotive industry is committed to continuously improving quality, environmental performance and energy efficiency. Energy-efficient equipment is installed where feasible, but downsizing and internal competition for funds are challenging energy managers who are seeking to make major gains.

Environmental issues, now a major component in corporate planning, have led to the implementation of costly technologies that improve the environment and friendliness of the industry's products and reduce emissions at the cost of increased energy use. This adds to the challenge of reducing energy consumption.

ACTION REPORT

The Transportation Equipment Manufacturing Task Force continued to promote energy awareness at its annual conference held in May 1997 at the General Motors of Canada head office in Oshawa, Ontario. The conference began with a strong message about the importance of building energy efficiency into corporate environmental management systems, followed by presentations of a variety of successful energy projects within the industry, a member survey and a program dealing with

energy and the environment. The Automotive Parts Manufacturers Association and the Ontario Ministry of the Environment distributed copies of a *Guide to Resource Conservation and Cost Savings Opportunities in the Automotive Parts Manufacturing Sector*, and the conference closed with a progress report on CIPEC and climate change issues.

ACHIEVEMENTS

A robust economy and major capital projects in the industry contributed to an increase in the sector's energy consumption in 1997. However, the year also brought a number of energy efficiency success stories:

- ① Chrysler Canada's Mississauga Parts Centre won an award for an energy management program that realized significant energy savings.
- ② Ford of Canada launched a departmental metering and monitoring program at its Oakville Assembly Plant, which focuses on reducing energy use in non-peak hours as well as generating data for its energy cost management and accountability system.
- ③ General Motors of Canada implemented a heating and ventilation optimization program that reduces electricity, steam and compressed air. The company also retrofitted its lighting systems to improve illumination while reducing power consumption.
- ④ Presstran installed an engine-driven compressor powered by natural gas, keeping its electrically driven system as a backup. Ford plans to install a system at its St. Thomas, Ontario, plant that will use waste heat to preheat combustion air for body preparation equipment.

Overall, the transportation manufacturing sector's energy use is less than 2 percent of the total energy used by Canadian industry, with automotive assembly and painting operations consuming most of this total.

OBJECTIVES & TARGETS

The transportation manufacturing sector continues to support a goal of a 1 percent per year improvement in energy intensity through the year 2000. The industry will support efforts to reach this goal by holding an energy conference in the second half of 1999, by encouraging auto parts suppliers to join the Industrial Energy Innovators program and by seeking to include aerospace and marine manufacturers in its Task Force. In addition, the industry will monitor the progress of the performance contracting "payback from savings" project which will be reconstructed to comply with "off book" financing concepts that provide a vital source of funds for extended payback energy improvement investments.



WOOD PRODUCTS



PERFORMANCE HIGHLIGHTS

- ➲ AN IMPROVED ABILITY TO TRACK ENERGY SOURCES SINCE 1995 HAS SIGNIFICANTLY CHANGED THE SECTOR'S ENERGY CONSUMPTION PICTURE
- ➲ COUNCIL OF FOREST INDUSTRIES HELPED ORGANIZE A CONFERENCE PROMOTING THE USE OF WOOD WASTE ENERGY IN THE WOOD PRODUCTS SECTOR
- ➲ THE MARCEL LAUZON SAWMILL IS ONE OF 12 FIRMS RECOGNIZED FOR ENERGY EFFICIENCY
- ➲ INDUSTRY HAS MADE SIGNIFICANT PROGRESS IN EFFORTS TO SWITCH TO BIOMASS FUELS
- ➲ ENERGY EFFICIENCY OPPORTUNITIES IN THE SOLID WOOD INDUSTRIES, A TASK FORCE DEVELOPED PUBLICATION, IS DISTRIBUTED TO THE SECTOR

Canada's wood products sector employs nearly 20 000 workers in almost 3000 facilities across Canada. Closely aligned with the pulp and paper industry, the sector includes sawmills, planing mills and shingle mills and produces everything from timber to finished lumber destined for domestic, North American and world markets. In 1997, the sector consumed 67 246 TJ of energy, up significantly from the 1990 total of 37 356 TJ.

CHALLENGES

Because the wood products and pulp and paper industries are closely linked, it has been difficult to isolate the beneficial impact of many of the sector's energy efficiency efforts, such as wood waste cogeneration. In fact, until 1995, the data collected did not quantify biomass usage by the wood products sector, attributing all biomass data entirely to the pulp and paper industry. This makes 1990 energy consumption figures an inappropriate base year against which to measure the wood products sector's energy performance. It is likely the sector will switch from a 1990 to a 1995 base year, enabling the sector to show a disaggregation of biomass from other fuel sources in the 1998/1999 Annual Report.

Since 1995, the improved ability to track both purchased and internally generated energy sources has significantly changed the sector's energy consumption picture. The picture is complicated by the production of a broad product range, including everything from low energy intensity shingles to new products with a high energy component. In fact, one of the most significant challenges to the industry's efforts to improve energy efficiency is a shift in the marketplace toward more energy-intensive, high-technology products such as strand board and new structural materials. Between 1990 and 1996, for example, the value of products shipped rose 24 percent per year, while the production of low energy input shingles remained relatively level. This market shift is forcing the industry to increase its overall use of energy and will make it difficult to demonstrate improvements in energy intensity.

ACTION REPORT

- In the spring of 1998, the Council of Forest Industries helped organize a conference focused on increasing the use of wood waste energy in the wood products sector. Cogeneration projects, such as that launched recently by Crestbrook Forest Products, are typical of the initiatives now under way in the sector to optimize energy use.
- In the fall of 1997, the Marcel Lauzon sawmill in Quebec was one of 12 firms recognized for energy efficiency by a special edition of the magazine *La Maîtrise de l'énergie*. The sawmill was cited for innovations including the application of high-technology analysers to improve process usage rates and the installation of a cogeneration facility to provide increased thermal energy for its drying kilns.

ACHIEVEMENTS

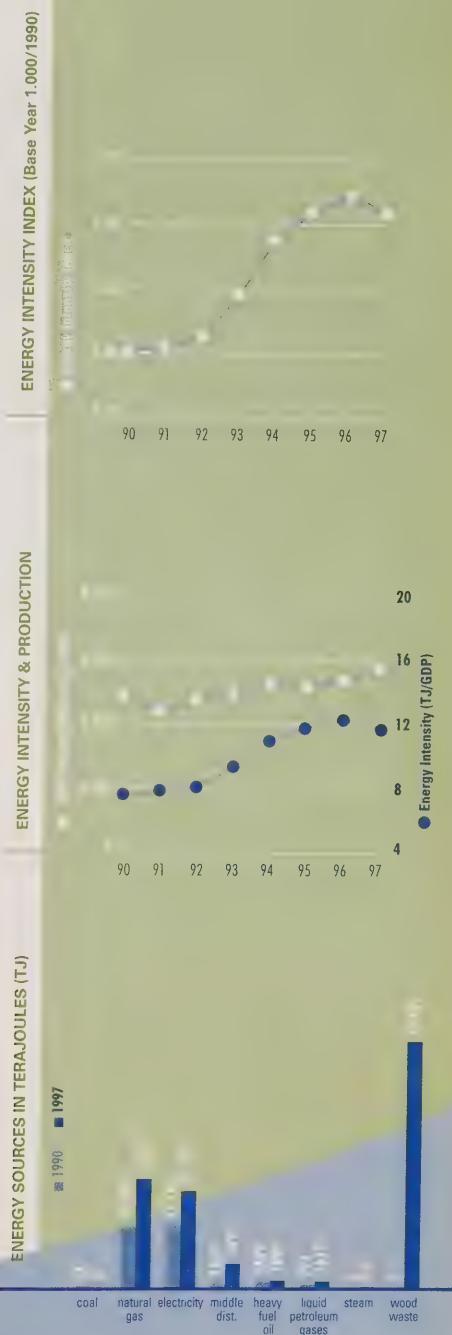
The wood products industry has made significant progress in efforts to switch to biomass fuels. Wood waste, which provided 50 245 TJ of energy in 1995, supplied 69 097 TJ in 1997, an increase of 38 percent. Biomass, which represented 45 percent of total energy used in 1995, now makes up nearly 55 percent of total energy consumed.

Individual companies in the industry continue to implement low-cost energy efficiency measures whenever possible. However, the sector's production and energy efficiency continue to be adversely affected by economic factors. Companies have increased their focus on product improvement and marketing, efforts that have forced a change in their product mix and lead to greater energy consumption.

Energy Efficiency Opportunities in the Solid Wood Industries, a task force developed publication, was distributed to the sector in British Columbia in 1996 and in the rest of Canada in 1997. In the first quarter of 1998, the publication was promoted in *Canadian Industrial Equipment News* with a subsequent distribution to equipment and services providers.

OBJECTIVES & TARGETS

Despite the problems of developing accurate and meaningful data, the wood products sector has adopted the CIPEC energy intensity improvement target of 1 percent per year through to the year 2000. The sector will continue to promote energy efficiency as a key management tool in all well-run forest products companies.



Innovators

by sector

The Industrial Energy Innovators Initiative focuses on transforming the sector-level commitments made by the task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of December 31, 1998, 249 manufacturing and mining companies representing over 75 percent of industrial energy use have signed on as Industrial Energy Innovators. The majority of these companies are participants in the Climate Change Voluntary Challenge and Registry Inc.

Aluminum

Alcan Smelters and Chemicals Ltd.
Aluminerie Alouette inc.
Aluminerie de Bécancour inc.
Aluminerie Lauralco inc.
Société Canadienne de Métaux Reynolds, Limitée

Moosehead Breweries Ltd.
Pepsi-Cola Canada Beverages
Sleeman Brewing and Malting Co. Ltd.
Sun-Rype Products Ltd.
Versacold Corporation

Cement

ESSROC Canada Inc.
Inland Cement Limited
LaFarge Canada Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
Tilbury Cement Limited

General Manufacturing

3M Canada Inc.
ABCO Property Management Inc.
Block Drug Company (Canada) Ltd.
Canadian Uniform Limited
Champion Feed Services Ltd.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Euclid-Hitachi Heavy Equipment Ltd.
Federated Co-operatives Ltd.
Fibrex Insulations, Inc.
Garland Commercial Ranges Limited
Gould Shawmut Company
Greif Containers Inc.
Huls Canada Inc.
Imperial Home Decor Group Canada Inc.
Imperial Tobacco Limited
Interface Flooring Systems (Canada) Inc.
International Paper Industries Limited
Jones Packaging Inc.
Kindred Industries
Kodak Canada Inc.
LePage (Division of Henkel Canada Limited)
Maksteel Inc. (Division of Makago Industries Ltd.)
Marcel Lauzon Inc.
Meridian Clemmer Industries Ltd.
Metroland Printing, Publishing & Distributing Ltd.
Morton International Ltd.
Polytainers Inc.
PRO-ECO Limited
Regent Eco Canada
Scapa Tapes North America
S.C. Johnsons & Sons, Limited (Johnson Wax)
Simmons Canada Inc.
Starcan Corporation
Superior Radiant Products Ltd.
Tamrock Canada Ltd.
Tamrock Loaders Inc.
Teknion Furniture Systems
The Source Medical
VicWest Steel
Viskase Canada Inc.
Wabash Alloys Ontario
Wescast Industries Inc.
Wyeth-Ayerst Canada Inc.

Chemicals

Celanese Canada Inc.
Chinook Group – Sombra Plant
DuPont Canada Inc.
Elementis Pigments Canada
MDS Nodion Inc.
Nakan Products Limited
Synergistics Industries Limited

Electrical/Electronics

ASCOLECTRIC Ltd.
Broan Limited
Honeywell Limited
IBM Canada Ltd.
Nortel (Northern Telecom Limited)
Osram Sylvania Ltd.
Vansco Electronics Ltd.

Food and Beverage

Andrés Wines Ltd.
Casco Inc.
Coca-Cola Beverages Ltd.
Cuddy Food Products
Garden Province Meats Inc.
H.J. Heinz Company of Canada Ltd.
Hub Meat Packers Ltd. – Sunrise Brand
Kraft Canada Inc.
Labatt Breweries of Canada
Maple Leaf Meats
Maple Leaf Pork
Maple Lodge Farms Ltd.
Molson Breweries

Lime

Chemical Lime Company of Canada Inc.
Continental Lime Ltd.
Global Stone Ingersoll Ltd.
Graybec Calcium Inc.
Havelock Lime (Division of Goldcorp. Inc.)

Nova Corporation
Parkland Refining Ltd.
Petro-Canada
Safety-Kleen
Shell Canada Products Limited
Suncor Energy Inc. – Sunoco Group
Ultramar Ltd. – Saint-Romuald Refinery

Mining

Aur Resources Inc.
BHP Diamonds Inc.
Brunswick Mining Division (Brunswick Mining and Smelting Corporation Limited)
Brunswick Smelting and Fertilizer Division (Brunswick Mining and Smelting Corporation Limited)
Cominco Ltd.
Echo Bay Mines Ltd. – Lupin Operation
Falconbridge Limited
Fonderie Horne – Métallurgie Noranda inc.
Hemlo Gold Mines Inc., Golden Giant Mine
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Ltd.
INCO Limited
International Minerals and Chemicals (Canada) Global Limited
(IMC Kalium Canada Ltd.)
Iron Ore Company of Canada
La Mine Doyon (Barrick Gold Corporation – Cambior Inc.)
Mines et exploration Noranda inc.
– Division Matagami
Mines Wabush (gérées par la Compagnie Minière Cliffs inc.)
Noranda Metallurgy Inc. (Canadian Copper Refinery)
Placer Dome Canada Limited
Quebec Cartier Mining Company
Syncrude Canada Ltd.
Teck Corporation
Westmin Resources Limited
Zinc Électrolytique du Canada Limitée / Canadian Electrolytic Zinc Limited

Plastics

Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.

Potash

Potash Corporation of Saskatchewan Inc.
– Allan Division
– Cory Division
– Lanigan Division
– New Brunswick Division
– Patience Lake Division
– Rocanville Division

Pulp and Paper

Abitibi-Consolidated Inc.
Aenor Inc.
Canfor Corporation
Cariboo Pulp and Paper Company Limited
Daishowa Inc.
Donohue Inc. (QUNO Inc.)
E.B. Eddy Forest Products Ltd.
Eurocan Pulp and Paper Company Limited
F.F. Soucy Inc.
Fletcher Challenge Canada Ltd.
Fort James-Marathon, Ltd.
James MacLaren Industries Inc.
Kruger Inc.
Lake Utopia Paper
MacMillan Bloedel Limited
Maritime Paper Products Limited
Noranda Forest Inc.
Paperboard Industries International Inc.
(Division of Cascades Inc.)
Repar Enterprises International Inc.
Riverside Forest Products Limited
Spruce Falls Inc.
St. Marys Paper Ltd.
Stora Forest Industries Limited
Tembec Inc.
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.
Weyerhaeuser Canada Ltd.

Petroleum Products

Amoco Canada Petroleum Company Limited
Canadian Tire Petroleum
Chevron Canada Limited – Burnaby Refinery
Husky Oil Operations Ltd.
Imperial Oil Limited
Interprovincial Pipe Line Inc.
Irving Oil Limited

Rubber

Gates Canada Inc.
Michelin North America (Canada) Inc.
NRI Industries Inc.

Spinrite Inc.
Stewart Group Ltd. (The)
St. Lawrence Corporation
Union Felt Products Inc.
Vagden Mills Limited
Velcro Canada Inc.
Vitafoam Products Canada Ltd.
Weavexx Corporation

Steel

Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels
CHT Steel Company
Co-Steel LASCO
Dofasco Inc.
Frost Wire Products Ltd.
Gerdau Courtice Steel Inc.
Hilton Works (Division of Stelco Inc.)
Ivaco Inc. (Ivaco Rolling Mills)
Lake Erie Steel Company Ltd.
Laurel Steel (Division of Harris Steel Limited)
QIT – Fer et Titane Inc.
Slater Steels Inc. – HSB Division
Stelco Fasteners Ltd.
Stelco Inc.
Stelco-McMaster Ltée
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.
Sydney Steel Corporation
Welland Pipe Ltd.

Transportation Manufacturing

Accuride Canada Inc.
AlliedSignal Aerospace Canada Inc.
Altek Automotive Castings
Bombardier Inc.
Cami Automotive Inc.
Canadian General-Tower Limited
DaimlerChrysler Canada
Eaton Corporation – Suspension Division
Ford Motor Company of Canada, Limited
Freightliner of Canada Ltd.
General Motors of Canada Limited
Kelsey Hayes Canada Ltd.
Magna Corporation –
Cosma Body & Chassis Systems
McDonnell Douglas Boeing Canada Ltd.
Navistar International Corporation Canada
Oetiker Limited
Orenda Aerospace Corporation
Orion Bus Industries
Polywheels Manufacturing Limited
Pratt & Whitney Canada Inc.
Prévost Car Inc.
Rockwell International
Russel Metals Inc.
Toyota Motor Manufacturing Canada Inc.
Volvo Canada Ltd.
Woodbridge Group (The)

Textiles

Agmont Inc.
Albarrie Canada Limited
Britex Group (The)
Cambridge Towel Corporation (The)
Canada Cordage Inc.
Canada Hair Cloth Company Limited
Cavalier Textiles
Coats Bell
Coats Patons
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Consoltex Inc.
Cookshire Tex
Dominion Textiles Inc.
Fabrene Inc.
Glendale Yarns Inc.
J.L. de Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Nova Scotia Textiles, Limited
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- The AEC Nova Scotia Division
- The AEC Manitoba Division
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The Aluminum Industry Association

The Automotive Parts Manufacturers' Association

The Canadian Chemical Producers' Association

The Canadian Fertilizer Institute

The Canadian Foundry Association

The Canadian Gas Association

The Canadian Lime Institute

The Canadian Petroleum Products Institute

The Canadian Plastics Industry Association

The Canadian Portland Cement Association

The Canadian Pulp and Paper Association

The Canadian Steel Producers Association

The Canadian Textiles Institute

The Canadian Vehicle Manufacturers' Association

The Council of Forest Industries

The Electro-Federation of Canada

The Mining Association of Canada

The National Dairy Council

The Ontario Food Processors' Association

The Rubber Association of Canada

Glossary of Terms

Annual Census of Mines

Natural Resources Canada survey that collects information on SIC 06 and SIC 08.

Annual Survey of Manufacturers (ASM)

Statistics Canada survey. Provides information on the Consumption of Purchased Fuels and Electricity (CPFE) for approximately 230 subsectors at four-digit SIC code levels.

Base Year

A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Climate Change Voluntary Challenge and Registry (VCR) Inc.

The VCR Inc., is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce greenhouse gas emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce greenhouse gases from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Energy Innovators Initiative provides a means for manufacturing and mining companies to enroll in the VCR.

CO₂

A compound of carbon and oxygen that in its normal gaseous state is clear and colourless. CO₂ is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions not involving combustion.

Economic Energy Intensity

Energy consumption per unit of economic output.

Embodied Energy

The energy consumed to transform all upstream raw materials into the final product; in a life cycle approach, it would be the "cradle-to-grave" energy burden.

Energy Intensity

Energy consumption per unit of output.

Energy Intensity Indicator

A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures

Any of a variety of metrics that would indicate an aspect of energy performance.

Framework Convention on Climate Change (FCCC)

United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing greenhouse gas emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)

A greenhouse gas absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main greenhouse gases are carbon dioxide (CO₂), methane (CH₄), chlorofluorocarbons (CFCs) and nitrous oxides (N₂O). By far the most abundant greenhouse gas is CO₂, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)

The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1986 dollars.

Higher Heating Value

The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called gross calorific value or gross heating value).

Industrial Consumption of Energy Survey (ICE)

Statistics Canada survey on energy use. Covers purchased and nonpurchased energy for approximately 24 industrial subsectors.

Lower Heating Value

The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the lower calorific value or the net heating value).

Natural Resources Canada (NRCan)

As the predominant natural resource department of the federal government, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Physical Energy Intensity

Energy consumption per unit of physical output.

Quarterly Report on Energy Supply and Demand (QRESD)

Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are mainly gathered by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

Specific Energy (Consumption)

Energy consumption per physical unit of output (also called physical energy intensity).

Standard Industrial Classification (SIC)

Statistics Canada uses a classification system that categorizes establishments into groups with similar economic activities.

Statistics Canada (STATS CAN)

Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the Statistics Act, Statistics Canada is required to collect, compile, analyse, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Tier I

Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier 1 industries are Pulp & Paper, Petroleum Refining, Cement, Mining, Steel, Chemicals and Aluminum. The Tier 1 industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II

Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier 1 industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP.



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